UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105-3901

June 19, 1992

Mr. Hamid Saebfar
Program Supervisor, Site Mitigation Branch
California Environmental Protection Agency
Department of Toxic Substances Control
1405 North San Fernando Boulevard, Suite 300
Burbank, California 91504

RE: Glendale North Operable Unit

Dear Mr. Saebfar:

Thank you for your letters of May 28, 1992, June 2, 1992 and June 16, 1992 regarding the Glendale North Operable Unit interim remedy. This letter responds to each of the points made in your letters, starting with the May 28, 1992 letter (which deals with EPA's preliminary determination of applicable or relevant and appropriate requirements ("ARARs") for the cleanup), then moving onto the issues raised in your June 2 letter (which contains an additional comment on EPA's Feasibility Study Report), and finally responding to your comments on EPA's Draft Proposed Plan.

Response to Points Raised in May 28, 1992 Letter

Point 1. Disposal of Investigation Derived Waste that may be Identified as Hazardous Waste

I have followed the format contained in your letter for breaking this point into subissues.

A. The VOC-contaminated water to be extracted is not a listed hazardous waste because we do not have positive records of the exact industrial processes in which the TCE and PCE in the groundwater were originally used. We agree that, with respect to testing toxicity for the purposes of determining whether a material is a characteristic hazardous waste, the state regulations are more stringent in some respects. However, EPA has reviewed the data available to date on drill cuttings at the site and does not believe that these materials would qualify as characteristic wastes under either the federal test or the state test.

B. We have set forth in detail in response to Point 10, below, the extent of our communications with both the Regional Water Quality Control Board and the State Water Quality Board. Neither agency has identified the information contained under this Subpoint in your September 17, 1990 letter. EPA has, however, identified certain aspects of the federal Resource Conservation and Recovery Act ("RCRA") as being ARARs. (See Section 6 of the Remedial Investigation Report for the Glendale Study Area, January 1992 which was included in our February 12, 1992 letter to your office). The basic effect of this identification is that extracted groundwater containing TCE or PCE above 5 ppm will be managed as hazardous waste under federal RCRA requirements.

C. The third and fifth bullets under Point 1 relate only to off-site transport or disposal of wastes. For off-site activities, the person carrying out the action must comply with all requirements applicable at the time that the off-site activity occurs. There are not "relevant and appropriate" requirements for off-site activities. Therefore, it is not necessary to select ARARs for offsite activities in the Record of Decision.

D. With the exception of Subsection 67108(a), which deals with precipitation design standards, EPA does not agree that the requirements cited here would be applicable to the North Glendale interim remedy. Title 22 California Administrative Code Subsection 66300(f) provides that "[w]herever the regulations of this chapter require specific design standards or criteria, the owner or operator shall design in accordance with those standards and criteria or provide a design, subject to approval by the [State of California], that provides for an equivalent level of protection for public health and the environment." The types of requirements which EPA will impose upon the remedy will provide an equivalent level of protection for public health and the environment as that provided by those specific design standards and criteria specified in Point 1.D. The requirement for approval by the a state agency is an administrative requirement which would not be part of the ARAR.

For some of the requirements, there were also other reasons why they could not be an applicable requirement (e.g., they did not deal with the type of unit being constructed or they were administrative in nature). EPA also decided to consider whether, in the absence of applicability, any of these requirements would be relevant and appropriate. EPA reviewed each of the specific requirements cited in your Point 1.D to determine whether any of them should be considered relevant and appropriate for the VOC treatment plant. Further discussions as to the applicability or relativity and appropriateness of each of the requirements is set forth here:

Security (Section 67103) EPA does not believe it would be appropriate to impose these requirements on the treatment plant because adequate authority to require measures necessary to ensure security at the plant are already available through the remedy selection process. For instance, EPA will require that the VOC treatment plant be designed and operated so as to prevent the unknowing entry, and minimize the possible effect of unauthorized entry, of persons or livestock into the active portion of the facility.

General Inspection Requirement (Section 67104) EPA does not believe this requirement could qualify as an ARAR as it appears to be administrative in nature. To the extent that it may contain substantive elements, the types of activities and provisions EPA requires in its health and safety plans and operation and maintenance plans will provide adequate protection from the concerns which might otherwise be addressed by this type of requirement, thereby making it inapplicable through the operation of Title 22 Cal. Admin. Code Subsection 66300(f) and inappropriate in any event.

Seismic and Precipitation Design Standards (Section 67108)

EPA agrees that Subsection 67198(a), which deals with design standards related to a 24-hour probable maximum precipitation storm, does appear to be applicable. If for any reason, this requirement were not applicable, it would still be relevant and appropriate and EPA intends to select it as an ARAR in the Record of Decision, unless further information revealed during the public comment period indicates otherwise.

Subsection 67198(b) on its face only applies to a specific subset of waste units which do not include a VOC treatment plant. The types of units covered are not similar enough to a VOC treatment plant to justify imposition of these requirements as being relevant and appropriate.

Local Authorities Arrangement (Section 67126) These requirements are administrative in nature and therefore cannot be ARARs.

Contingency Planning (Section 67140, et seq.) These requirements are administrative in nature and therefore cannot be ARARs.

Point 2. Workers' Right-to-know Requirement

EPA disagrees that administrative requirements such as those cited under this Point meet the definitional requirements which are a prerequisite to designation as an ARAR. This was fully explained in the insert to our letter of February 12, 1992. Therefore, EPA's position remains that this cited requirement is not an ARAR for the Glendale interim remedy.

Point 3. Community Right-to-know Requirement

Our statement under Point 2, above, is equally applicable to this Point.

Point 4. Hazardous Waste Management Plan

This issue has been resolved, per your letter.

Point 5. Public Water Supply System Siting Requirements

Your most recent letter refers to the communications between EPA and the California Office of Drinking Water ("ODW"). ODW wrote to the Los Angeles Department of Water and Power regarding ARARs on September 13, 1990. On February 12, 1992, we sent ODW a copy of our initial determination of ARARs for the Glendale interim remedy, contained in the Remedial Investigation Report. ODW responded to our February 12, 1992 letter on March 12, 1992. ODW has never identified the requirements cited under Point 5 in your earlier letter to the Los Angeles Department of Water and Power (dated September 17, 1990) as ARARs for this site. In addition, EPA stands by its earlier comments to you regarding these requirements (see our February 12, 1992 letter). For a discussion of permitting requirements and CERCLA 121(e)'s permit exemption, see the enclosed correspondence between ODW and EPA.

Point 6. DTSC Applied Action Levels

This issue has been resolved, per your letter.

Point 7. State of California Proposition 65

In response to EPA's request for elaboration on why this requirement should be considered an ARAR, the state noted that TCE and PCE are listed chemicals under Proposition 65 and asserted that this law should be considered relevant and appropriate. EPA disagrees. To be an ARAR, the requirements of this law would have to be more stringent than federal requirements. However, the regulations implementing Proposition 65 state that "[n]othing in this article shall preclude a person from using evidence, standards, risk assessment methodologies, principles, assumptions or levels not described in this article to establish that a level of exposure to a listed chemical poses no significant risk." CCR Title 22, Section 12701(a). EPA has performed a risk assessment meeting the requirements of CCR Title 22, Section 12721, and has determined that the standards that will be met in the cleanup pose "no significant risk," as intended by this regulation. The Proposition 65 Title 22 regulations , at Section 12703(b) state:

> For chemicals assessed in accordance with this section, the risk level which represents no significant risk shall be one

> which is calculated to result in one excess case of cancer in an exposed population of 100,000, assuming lifetime exposure at the level in question, except where sound consideration of public health support an alternative level, as for example, where a clean-up and resulting discharge is ordered and supervised by an appropriate governmental agency or court of competent jurisdiction. (emphasis added).

Thus, the statute and implementing regulations recognize that the alternative cleanup levels set by EPA for a Superfund cleanup are adequate to satisfy the requirements of the Act. Therefore, this law does not impose any more stringent requirement for the remedial action at this operable unit is not an ARAR.

Moreover, CCR Title 22, Article 4, Section 12401 (Discharge of Water Containing a Listed Chemical at Time of Receipt) provides in subdivision (b) as follows:

> Whenever a person otherwise responsible for the discharge or release, receives water containing a listed chemical from a source other than a source listed in subdivision (a) [subdivision (a) specifies a drinking water supply in compliance with all primary drinking water standards, which is not the case for this operable unit], the person does not "discharge" or "release" within the meaning of the Act to the extent that the person can show that the listed chemical was contained in the water received, and "discharge or release" shall apply only to that amount of the listed chemical derived from sources other than water, provided that:
> (1) the water is returned to the same source of water supply, or (2) the water meets all primary drinking water standards for the listed chemical or, where there is no primary drinking water standard, the water shall not contain a significant amount of the chemical.

Under EPA's preferred alternative, the water would either be delivered to the City of Glendale, in which case it would comply with Section 12401(b)(2), or it would be reinjected into the aquifer, in which case it would comply with both Sections 12401(b)(1) and (2). Therefore, under the terms of the statutes own implementing regulations, the remedial action does not constitute a discharge or release under Proposition 65.

In response to the state's comment that administrative requirements included in Proposition 65 should be included as relevant and appropriate requirements for the cleanup, EPA comments (in addition to the preceding discussion) that the response to Point 2 is also relevant. The state provided no further elaboration on why this requirement would be relevant and appropriate, including no discussion of the relevant factors under the National Contingency Plan, 40 C.F.R. Section 300.400(g)(2).

Point 8. State of California CEQA

The State originally identified CEQA as a potential ARAR in your September 17, 1990 letter to Walter Hoye of the L.A. Department of Water and Power. The letter contained a citation to the law and associated guidelines and included a one sentence description of what CEQA addresses. There was no discussion of why CEQA would be an ARAR for the Glendale interim remedy. In our letter of February 12, 1992, EPA included a two paragraph response which detailed the basis for EPA's determination that CEQA is not an ARAR for this site, including a specific explanation that we believe CEQA is no more stringent than the requirements of the several federal requirements we cited. Your response states only that the state "does not accept the determination that California CEQA is not an ARAR. [The state] stand[s] per the original statement." The state has not provided a single example of any manner in which CEQA is more stringent than applicable federal requirements, despite EPA's raising this concern. As you know, the requirement that a state ARAR be more stringent than federal requirements is a statutory requirement of CERCLA Section 121. The state has also not provided any explanation as to why this law should be an ARAR for this site. In the absence of any such analysis, EPA stands by its original response.

Point 9. California Safe Drinking Water Act

You again refer to communications between the California Office of Drinking Water (ODW) and EPA regarding ARARs. These communications have been described above in response to Point 5. We wrote to ODW on February 12, 1992 and provided them with EPA's preliminary determinations regarding ARARs. ODW's response to that letter, dated March 12, 1992, did not identify as ARARs any of the requirements referred to under Point 9 in your September 17, 1990 letter to the Los Angeles Department of Water and Power. For a discussion of permitting requirements and CERCLA Section 121(e)'s permit exemption, see the enclosed correspondence between EPA and ODW. EPA stands by its original response to Point 9, contained in its February 12, 1992 letter to you.

EPA does agree that the monitoring requirements found in Title 22 Cal. Admin. Code Sections 64421-64445.2 are ARARs for the portion of the remedy that involves delivering the water to the City of Glendale's Public Water distribution system. However, the selection of theses sections as ARARs would involve only the requirements that specific monitoring be performed. It would not include any administrative requirements (such as reporting requirements) and would also not include meeting substantive standards set within these sections since no such standards have been identified by the state as being more stringent than federal requirements.

Point 10. Porter-Cologne Water Quality Act and City of Glendale Requirements

You referred to certain items as ARARs in your September 17, 1990 letter to the L.A. Department of Water and Power. We had also received copies of letters from the Regional Water Quality Control Board (dated September 19, 1990) and the State Water Resources Control Board (dated October 26, 1990) to the L.A. Department of Water and Power, also purporting to identify ARARs for this site. Despite numerous problems with the ARARs identification in all three of these letters, EPA may a good faith attempt, based on its best professional judgment, to determine ARARs related to the Porter-Cologne Water Quality Act for this site from these letters. In addition to writing to you on February 12, 1992 and asking for further clarification, we also wrote to both the State Water Resources Control Board and the Regional Board, providing a copy of the EPA's preliminary determination of ARARs, including ARARs with respect to the Porter-Cologne Water Quality Act. We also offered them a thirty (30) day comment period on the ARARs determination. Neither agency responded. On May 4, 1992, we also sent the State Board and the Regional Board a copy of the Feasibility Study and requested comments. The State Board responded in a letter dated May 15, 1992, which does not mention any of the specific issues raised in your Point 10. Your response states that you are satisfied we are in communication with the State Board and Regional Board, and provides no further response on the issues we raised in our letter to you. Therefore, we stand by our preliminary determination of ARARs in this regard, and our comments to you in our February 12, 1992 letter.

As to your comment that the City of Glendale Public Works Department's requirements regarding usage of sanitary sewer facilities should be relevant and appropriate, EPA again notes, as stated in the insert provided with our February 12 letter and as provided by statute, local requirements cannot be ARARs. The statute only provides for designation of state or federal requirements as ARARS. See CERCLA Section 121. Furthermore, no citation to these requirements was provided.

However, EPA notes that any discharge to a sewer system leading to a publicly owned treatment works ("POTW") would be considered off-site. Anyone engaging in such a discharge would be required to comply with all applicable requirements in effect at the time of such discharge, including any local requirements.

Point 11. Mulford-Carrell Air Resources Act.

This issue appears to be resolved, per our letters. EPA intends to select as ARARs those requirements previously identified to it by the South Coast Air Quality Management District. The District's letter to us was sent to you with our last letter.

Response to June 2, 1992 Letter

You state that the Feasibility Study Report, Section 2.1, should also include a discussion regarding "future State MCLGs and the cumulative hazard index and how they will affect the use of treated groundwater as a drinking water source." Water served as drinking water is required to meet MCLs at the tap, not MCLGs. Therefore, EPA would generally not expect a future change in an MCLG to affect the use of treated groundwater as a drinking water source. The cumulative hazard index is also not an ARAR. However, EPA does retain the authority to require changes in the proposed remedy if necessary to protect human health and the environment, including changes to previously selected ARARS. See 40 C.F.R. Sections 300.430(f)(1)(ii)(B)(1) and 300.430(f)(5)(iii)(C). If EPA receives new information indicating the remedy is not protective of public health and the environment, EPA would review the remedy and make any changes necessary to ensure protectiveness.

Response to Points Raised in June 16, 1992 Letter

Point 1. Since the State expressed concern as to whether single-stage air stripping would be appropriate for consideration during the design phase of the Glendale North OU, EPA specifically called for public comment in the proposed plan on this issue. Changes to the preferred alternative may be made if public comments or additional data indicate that such a change would better achieve the cleanup goals for the site.

Point 2. Mention of gross alpha will be included in the risk assessment section of the proposed plan per your request. Both aluminum and barium have been included in groundwater sampling analyses. Barium was not included in the first two sampling events included in the Glendale RI Report (January 1992) but has been sampled routinely since 1990. Barium has been detected but at concentrations close to laboratory detection limits and has not been found to exceed the State MCL of 1 ppm. Aluminum has been detected in some groundwater samples and in some cases in excess of its secondary MCL of 1 ppm. Analyses for gross alpha, barium and aluminum are all included in EPA's groundwater monitoring program for the San Fernando Valley.

Point 3. A sentence was added to the proposed plan acknowledging that dermal contact was considered but was found by EPA not to pose a significant risk.

Point 4. The DHS Office of Drinking Water's role is addressed in point 3 of our June 19, 1992 letter to Gary Yamamoto of that office. The letter is enclosed here for your review.

Point 5. EPA agrees with your statement that air stripping is not a treatment for heavy metal contamination. However as described in detail under point 1 and in attachments 1 and 2 of the enclosed June 19, 1992 letter to the Office of Drinking Water, EPA does not believe that metals are contaminants of concern for the Glendale North OU and therefore does not consider it appropriate or necessary to include a statement in the proposed plan regarding metals treatment.

Point 6. This wording was added to the nitrate definition included in the proposed plan.

I hope this letter has addressed your comments. EPA hopes to continue to work together with the Department of Toxic Substances Control to address contamination in the San Fernando Valley. Should you have any additional questions, please contact me at (415)744-2249.

Sincerely,

Claire Trombadore

Claire Trombadore
Project Manager
San Fernando Valley Superfund Site

cc: Marcia Preston, EPA

enc: September 13, 1990 Letter from Gary Yamamoto, ODW to LADWP
February 12, 1992 Letter from Claire Trombadore to Gary Yamamoto, ODW
March 12, 1992 Letter from Gary Yamamoto, ODW to Claire Trombadore
June 12, 1992 Letter from Gary Yamamoto, ODW to Claire Trombadore
June 19, 1992 Letter from Claire Trombadore to Gary Yamamoto, ODW

State of California—Health and Welfare Agency PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES
OFFICE OF DRINKING WATER
1449 WEST TEMPLE STREET, ROOM 202
LOS ANGELES, CA 90026
(213) 620-2980
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June 12, 1992

Claire Trombadore
Project Manager
U.S. Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Dear Ms. Trombadore:

DRAFT PROPOSED PLAN FOR THE GLENDALE NORTH PLUME OU OF THE SAN FERNANDO VALLEY SUPERFUND PROJECT

The Office of Drinking Water of the California Department of Health Services has reviewed the above-mentioned plan and has the following comments:

1. Proposed Cleanup Plan

The proposed remedy involves the extraction of contaminated groundwater at 3,000 gallons per minute. Treatment would consist of dual-stage air stripping with vapor-phase GAC and blending with MWD water. The water would be conveyed to the City of Glendale for potable water or be reinjected into the aquifer. The groundwater is also contaminated with arsenic, mercury, nickel, zinc, chromium and bis (2-ethylhexyl) phthalate. What treatment will be provided to reduce these contaminants to levels below MCL's?

If the City of Glendale is refusing to accept the treated water because it does not meet MCL's, then reinjection may not be an acceptable alternative.

2. Background on the Groundwater Contamination in the San Fernando Valley

The testing of groundwater sources was requested by this Department in 1980, not 1979. The reason for the request was not Assembly Bill 1803, which was passed in 1983, but rather a result of finding organic chemical contamination in the groundwater of San Gabriel Basin in late 1979.

3. Selection of Cleanup Alternatives

Alternatives that involve the use of the treated water for drinking water must be approved by this Department through its permitting process (California Health and Safety Code, Sections 4010 to 4020.5).

Alternatives that involve the reinjection of the treated water into the aquifer or the recharge of the treated water in spreading grounds may not be acceptable unless treatment for contaminants other than VOC's is provided.

4. Alternative 2 - EPA's Preferred Alternative

The next to the last sentence in the first paragraph is not clear.

If you have any questions, please contact me at the above telephone number.

Sincerely,

Gary H. Yamamoto

Gary H. Yamamoto, P.E.
District Engineer

GHY:ehb

cc: LACDHS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105-3901

February 12, 1992

Mr. Gary Yamamoto
District Engineer
Office of Drinking Water
Department of Health Services
1449 West Temple Street
Los Angeles, CA 90026-5698

RE: Applicable and Relevant and Appropriate Requirements for the Glendale Study Area of the San Fernando Valley Superfund Project

Dear Mr. Yamamoto:

This letter serves two purposes. First, consistent with 40 C.F.R. § 300.515(h)(2), it requests that you communicate any additional applicable or relevant and appropriate requirements ("ARARs") for the Glendale North Plume Operable Unit of the San Fernando Valley Superfund Project within thirty (30) working days of your receipt of this letter. For your information, a list of the remedial alternatives which have resulted from the initial screening of alternatives is enclosed.

Secondly, it informs you of the determinations regarding ARARs and "to be considered" criteria ("TBCs") made during the initial screening of alternatives for the Glendale Operable Unit. These determinations are contained in Section Six of the January 1992 Remedial Investigation Report for the Glendale Study Area, which is enclosed. In working on this ARARs/TBC analysis with the Los Angeles Department of Water and Power, EPA reviewed your draft letter dated September 13, 1990, which dealt with ARARs and TBCs for this Operable Unit. It appears that several important legal criteria for ARARs identification may not have been adequately considered in the preparation of the September 13, 1990 letter. Therefore, we are providing a brief reiteration of some of these issues. In accordance with 40 C.F.R. § 300.515(h)(3), the state has a maximum of fifteen (15) working days from receipt of this letter to comment on the ARARs/TBC determinations contained in the enclosed Remedial Investigation Report for the Glendale Study Area.

In your September 13, 1990 letter, you enclosed a copy of the Office of Drinking Water's policy on the domestic use of groundwater contaminated with toxic substances. EPA would like to

emphasize that policies that are not contained in promulgated regulations (or statutes) cannot, by definition be ARARs. In addition, you mentioned recommended public health levels (RPHLs) in your letter. EPA learned from Vera Melnyk of your office that RPHLs are not yet promulgated and likely will not be by the time EPA's Record of Decision is adopted for the Glendale Operable Unit. Until RPHLs are promulgated, they are not ARARs for the Glendale Operable Unit. Finally, regarding the permit issues discussed in your letter, EPA would like to emphasize that permits are not required for onsite activities. Therefore, whether or not a permit will be required will depend upon whether the activity or activities, for which a permit would normally be required, is conducted onsite or offsite.

Should you have any questions please do not hesitate to contact me at (415) 744-2249 or have your attorney contact Marcia Preston, EPA Region IX Office of Regional Counsel, at (415) 744-1388.

Sincerely,

Claire Trombadore

Claire Trombadore
Project Manager

cc: Marcia Preston, EPA

DISCUSSION OF LEGAL FRAMEWORK PERTINENT TO IDENTIFICATION OF ARARs

The language of CERCLA Section 121(d)(2)(A) makes clear, and program expediency necessitates, that the requirements which are applicable or relevant and appropriate at a particular site must be specifically identified. It is not sufficient to provide a general "laundry list" of statutes and regulations that involve environmental requirements and state that they might be ARARs for a particular site. The state, and EPA if it is the support agency, must instead provide a list of requirements with specific citations as to the section of law identified as a potential ARAR, and a brief explanation of why that requirement is considered to be applicable or relevant and appropriate for the particular remedy or remedies contemplated for that site. EPA expects that states will substantiate submissions of potential ARARs by providing basic evidence of promulgation, such as a citation to a statute or regulation and, where pertinent, a date of enactment, effective date, or description of scope. See the Preamble to the National Contingency Plan ("NCP"), 55 Fed.Reg. 8746. The NCP itself requires that the agency identifying a potential ARAR include a citation to the statute or regulation from which the requirement is derived. 40 C.F.R. § 300.400(g)(5).

Section 121(d) of CERCLA defines both "applicable requirements" and "relevant and appropriate requirements" as **substantive** requirements, criteria or limitations that have been **promulgated** under federal environmental or state environmental or facility siting laws. Only those state standards that are ". . . identified in a timely manner and are more stringent than federal requirements . . ." may be ARARs. 40 C.F.R. § 300.5. These additional criteria for state ARARs are also contained in the statute. CERCLA Section 121(d).

Requirements that do not in and of themselves define a level or standard of control are considered administrative, not substantive. Administrative requirements include the approval of, or consultation with, administrative bodies, issuance of permits, documentation, and reporting and recordkeeping. 55 Fed Reg. 8756 and 53 Fed.Reg. 51443. Because these requirements are not substantive, they are not ARARs for response actions under CERCLA. CERCLA Section 121(e) provides that "[n]o Federal, State or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with this section." Therefore, permitting requirements do not apply to response actions which occur onsite. "Onsite" for permitting purposes is defined to include the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action. 40 C.F.R. § 300.400(e). Permitting requirements should not be "identified" as ARARs for response actions occurring at areas which come within this definition; such identification would directly contradict the

express wording of the statute. Although permits are not required for response actions conducted entirely onsite, if there are substantive standards, requirements of levels of control that would otherwise be included in a permit, these should be brought to our attention for consideration as ARARs.

State of California—Health and Welfare Agency PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES
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March 12, 1992

Ms. Claire Trombadore
Project Manager
United States Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Dear Ms. Trombadore:

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE GLENDALE STUDY AREA OF THE SAN FERNANDO VALLEY SUPERFUND PROJECT

Your letter of February 12, 1992 on applicable or relevant and appropriate requirements (ARARs) for the Glendale Study Area and for the Glendale North Plume Operable Unit (OU) has been reviewed by the Office of Drinking Water (ODW) of the California Department of Health Services and we have the following comments.

We concur that this Department's recommended public health levels and ODW's policy on the domestic use of groundwater levels contaminated with toxic substances are not ARARs. This is not to be perceived that ODW considers this water from the Glendale OU as being suitable as a domestic water supply.

The recommended alternative for the Glendale North Plume OU has not been identified. If the recommended alternative involves the distribution of treated contaminated groundwater to a water utility under permit by this Department, such as the City of Glendale, then we have concerns about the design, construction, operation, reliability, monitoring and inspection of the facilities involved in the extraction, treatment and distribution of the contaminated groundwater. A public water system is required by state law to get a permit amendment from ODW prior to adding any new source. If the Glendale OU involves the distribution of water to a public water system, then a permit amendment is required. We have previously voiced these concerns to your agency in regards to the Burbank Operable Unit. Those concerns apply equally to the Glendale OU.

If you have any questions, please contact me at the above telephone number.

Sincerely,

Gary H. Yamamoto

Gary H. Yamamoto, P.E.
District Engineer

GHY:ehb

cc: LACDHS
EPA - Steve Pardieck
Glendale - Mike Hopkins

TE OF CALIFORNIA—HEALTH AND WELFARE AGENCY GEORGE DEUKMEJIAN, Governor

PARTMENT OF HEALTH SERVICES
9 WEST TEMPLE STREET
, ANGELES, CA 90026-5698

September 13, 1990

Mr. Walter W. Hoye
Engineer of Design
City of Los Angeles
Department of Water and Power
Box 111
Los Angeles, CA 90051-0100

Dear Mr. Hoye:

SAN FERNANDO VALLEY SUPERFUND PROJECT

This is in response to your request for current Applicable or Relevant and Appropriate Requirements (ARARs) for the Glendale Operable Unit Feasibility Study (OUFS). Enclosed is a summary of all maximum contaminant levels (MCLs) and action levels (ALs) of the Office of Drinking Water (ODW) of the State Department of Health Services (SDHS).

The California Legislature passed a bill known as the Safe Drinking Water Act of 1989, which became effective January 1, 1990. The bill, among other things, requires SDHS to establish recommended public health levels (RPHLs), which are health-based standards without regard to cost impacts or other factors. ODW intends to begin establishing the RPHLs in late 1990 or early 1991.

Public water systems, which serve more than 10,000 service connections (City of Glendale is included) and which exceed an RPHL, will be required to evaluate all reasonable means of reducing the level of the contaminant to as close to the RPHL as feasible and to submit the evaluation to ODW at least annually. ODW upon review of the evaluation may require the water system to submit a water quality improvement plan, which shall identify all reasonable measures available to reduce the level of the contaminant, the costs of implementing the measures, and a proposed schedule of actions to be undertaken to reduce the level of the contaminant. Upon approval of the plan by ODW, the water system's domestic water permit will be amended or revised to include a time schedule for implementation of those measures found to be technically and economically feasible.

Enclosed is a copy of ODW's policy on the domestic use of ground water contaminated with toxic substances. We will use it to evaluate the Glendale OU.

The treatment provided should reduce the levels of contaminants as low as technically and economically feasible. The treatment systems should not be designed to just meet the drinking water standards.

Any water system receiving water from the OU for domestic use will be required to receive an amendment to their domestic water permit from ODW. The plans and specifications for the facilities of the OU will need to be reviewed by ODW as part of the domestic water permit process.

If you have any questions, please contact me at (213) 620-2980.

Sincerely,

Gary Yamamoto

Gary Yamamoto, P.E.
District Engineer
OFFICE OF DRINKING WATER

Enclosures(3)

cc: LACDHS

9/17 c: H. Venegas
A. La Monte (attn.)
E. Wong w/encl.

Groundwater Quality

State of California
Department of Health Services

Drinking Water Action Levels Recommended
by the Department of Health Services

July 1990

Chemical	Action Level parts per billion (ppb)
Pesticides	
Chlorinated Hydrocarbon	
Aldrin	Limit of Quantification (0.05)
a-Benzene Hexachloride (a-BHC)	0.7
b-Benzene Hexachloride (b-BHC)	0.3
Dieldrin	Limit of Quantification (0.05)
Pentachlorophenol	30.0
Organophosphate	
Dimethoate	140.0
Diazinon	14.0
Ethion	35.0
Malathion	160.0
Methyl Parathion	30.0
Parathion	30.0
Trithion	7.0
Carbamate	
Aldicarb	10.0
Baygon	90.0
Carbaryl	60.0
Phthalamide	
Captan	350.0
Amides	
Diphenamide	40.0
Fumigants	
Chloropicrin	50.0 (37.0)*
Miscellaneous	
Terrachlor (Pentachloronitrobenzene)	0.9
Herbicides	
CIPC (isopropyl N (3-chlorophenyl) carbamate)	350.0
Alachlor	Limit of Quantification (0.2)

*Taste & Odor Threshold

Purgeable Halocarbons		
Methylene Chloride	40.0	
Purgeable Aromatics		
1,2-Dichlorobenzene	130.0	(10)*
1,3-Dichlorobenzene	130.0	(20)*

(Action Level for 1,2-Dichlorobenzene and 1,3-Dichlorobenzene is either for a single isomer or for the sum of the 2 isomers)

Toluene	100.0	
Phenols		
2,4-dimethylphenol	(400.0)*	
Phenol	(5.0)*	(For Chlorinated Systems)
Aldehydes		
Formaldehyde	30.0	

*Taste & Odor Threshold

September 22, 1988

POLICY GUIDANCE FOR DIRECT DOMESTIC USE OF GROUNDWATER CONTAMINATED WITH TOXIC SUBSTANCES

A. Purpose of Guidelines

Most plans for cleaning up groundwaters contaminated with toxic substances involve extraction of the contaminated groundwater and treatment to remove or reduce the contaminants. The treated groundwater then must either be disposed of or reused. In water short areas, this treated groundwater is often considered to be a valuable resource which should not be discarded. In a growing number of situations, there is an interest in utilizing this water directly in a domestic water supply distribution system. The purpose of this guidance document is to set forth the position and the basic tenets by which the Public Water Supply Branch (PWSB) would consider such a proposal.

It is recognized that the circumstances surrounding each situation may be different. Proposals, therefore, must be considered on a case-by-case basis. This document is intended to set forth basic public health principles which should be used by the PWSB staff in evaluating proposals and in establishing appropriate permit conditions for any direct use.

B. General Philosophy

The primary goal of the PWSB drinking water program is to assure that all Californians are, to the extent possible, provided a reliable supply of safe drinking water at all times. In furtherance of this goal, the PWSB continues to subscribe to the basic principle that only the best quality sources of water reasonably available to a water utility should be used for drinking. When feasible choices are available, the sources presenting the least risk to public health should be utilized. Furthermore, these sources should be protected against contamination. Whenever possible, lower quality source waters should be used for nonconsumptive uses where there are lower health risks (i.e., irrigation, recreation, groundwater replenishment, or industrial uses).

Water utilities should be encouraged to minimize the concentration of toxic substances in drinking water (maximum contaminant level [MCL] notwithstanding) whenever this can be accomplished with reasonable and cost effective operation measures.

Where reasonable alternatives are available, high quality drinking water should not be allowed to be degraded by the planned addition of contaminants. In other words, the MCLs

should not be used to condone contamination up to those levels where the addition of those contaminants can be reasonably avoided.

Drinking water quality and public health considerations shall be given a greater weight than costs or cost savings.

The PWSB recognizes that there are contaminated groundwaters in California which need to be cleaned up and where the resulting product water represents a significant resource which should not be wasted. In some situations, it may be reasonable to consider the use of these treated contaminated groundwaters for domestic use. Some communities may not have any choice. In such cases, the public health principles set forth in the following section should be used to guide the evaluation of such situations.

C. Principles

1. Alternative sources of drinking water reasonably available to a water utility should be evaluated as to comparative risk (assuming MCLs are, or can be, met). These risks should be compared to cost benefits and a judgement made as to the best source to be used within reasonable cost factors.

2. In evaluating the relative risk comparison of alternative sources, additive effects of multiple contaminants are an important consideration. Generally, consideration of allowing direct reuse of contaminated groundwater should be limited to single toxic contaminants or a limited number of similar chemicals which can be reliably treated with the same process.

3. Blending may be considered acceptable in lieu of treatment for relatively low levels (i.e., less than ten times the MCL) of contaminants which have lower levels of associated risk as long as the blending process is fully reliable and takes place prior to any entry into the distribution system.

D. Principles Governing Use of Significantly Contaminated Groundwaters

1. Groundwater containing multiple contaminants, groundwaters which are likely to contain unknown contaminants (such as groundwater subject to contamination from a hazardous waste disposal site), or highly contaminated groundwater should not be considered for direct human consumption where alternatives are available.

2. Where alternative sources present greater overall risks or are not available, and the groundwater contains high concentrations of contaminants or multiple contaminants, the treatment process used to treat the contaminated groundwater prior to direct usage in a domestic water distribution system must be commensurate with the degree of risk associated with the contaminants. As a minimum, treatment for relatively high risk sources shall include use of the best available treatment technology defined for that contaminant by the Environmental Protection Agency. Furthermore, the treatment processes must have full reliability features consistent with the type and degree of contamination in the groundwater.

3. The treatment process used must be capable of reliably producing water meeting MCLs in the discharge line from the final treatment process at all times. Any water from other sources that is available for blending prior to entry into the distribution system should be used to provide an additional safety factor.

4. Facilities for treating water containing specific contaminants, for which the MCL is higher than the maximum contaminant level goal (MCLG) and where the water is intentionally added to the distribution system, should be designed and operated to meet the MCLG where this can be accomplished in a cost effective manner.

5. Projects proposing to use highly contaminated groundwater as a source of domestic water supply should be subjected to a public hearing or meeting prior to the issuance of a domestic water supply permit, regardless of compliance with MCLs.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, Ca. 94105-3901

June 19, 1992

Mr. Gary Yamamoto
Office of Drinking Water
Department of Health Services
1449 West Temple Street
Los Angeles, CA 90026-5698

RE: Draft Proposed Plan for the Glendale North Plume OU of the San Fernando Valley Superfund Project

Dear Mr. Yamamoto:

EPA has received your letter dated June 12, 1992 regarding comments on the Draft Proposed Plan for the Glendale North Plume Operable Unit (May 21, 1992). EPA would like to take this opportunity to respond to your comments.

1. Proposed Cleanup Plan

Data regarding contaminants in the groundwater in the Glendale Study Area obtained by EPA during the remedial investigation was used to estimate the health risks associated with exposure to the groundwater. As stated in the Draft Proposed Plan, EPA completed a risk assessment for the Glendale North OU in January 1992 that estimated the potential risks to public health under current situations and under potential future situations. The risk assessment examined the potential health effects if individuals were exposed to contaminated groundwater from the upper and lower zones of the aquifer. Chemicals of potential concern for the Glendale North OU used in the risk assessment calculations included: TCE, PCE, carbon tetrachloride, 1,1-DCA, 1,2-DCA, 1,1-DCE, total 1,2-DCE, nitrate, and others including some metals detected in both trace quantities and, on occasion, above MCLs.

Some metals including arsenic, nickel, mercury, zinc, and chromium were detected above MCLs in one or more of the shallow monitoring wells, during the initial sampling event of September 1989. The initial event took place shortly after the wells were developed and the samples were not filtered to remove any suspended solids. All subsequent sampling events included filtering of the samples to accurately represent the levels of dissolved metals constituents. No metals with the exception of chromium and lead which were detected just once at levels just slightly above their MCLs and mercury which was detected twice at levels just slightly

1above the MCL, in one coarsely filtered sample have been detected above MCLs since the initial sampling event. In addition, the sampling data from the initial sampling event was not verified and therefore is not reliable. The administrative record guidance directs EPA not to include unvalidated data in the administrative record and therefore EPA may not rely upon such data in remedy selections.

EPA believes that samples collected during the initial sampling event contained suspended particulate matter. The samples were not filtered and were preserved using nitric acid preservative. The nitric acid preservative effectively dissolves the suspended solids in the samples thus increasing the metals concentrations in these samples. This particulate matter may have been introduced during drilling or from formation disturbance of the naturally occurring sediments. The first step in any treatment of the extracted groundwater will include prefiltration prior to treatment for VOCs to ensure the removal of any particulate matter. These particulates may be the result of several factors including well construction, well development, and sampling techniques. The EPA believes that these particulates do not accurately reflect in-situ groundwater conditions for the unfiltered samples. EPA believes that the metals detected in some monitoring wells during the initial sampling event are not compounds of concern for the Glendale North OU and that they do not pose any risk to public health. In addition, EPA will continue to monitor the groundwater of the Glendale Study Area to ensure that metals are not contaminants of concern.

The preferred remedy would require treatment of the groundwater to MCLs for all contaminants of concern. Therefore, any water to be accepted by the City of Glendale is expected to meet all current MCLs. EPA's preferred alternative involves reinjecting the treated water if the City declines for any reason to accept the water. Enclosed for your review are two memoranda that further support EPA's position regarding metal detections in groundwater samples obtained during the early sampling events (see attachments 1 and 2).

2. Background on the Groundwater Contamination in the San Fernando Valley

We will change the Proposed Plan to reflect this more accurate information, as provided by you.

3. Selection of Cleanup Alternatives

CERCLA Section 121(e) provides that no permit shall be required for the onsite portion of any remedial action. Therefore, no permit can be required for the design, construction or operation

of the VOC treatment plant. However, all substantive requirements of any permit which would have been required shall be included in the selected remedy through the process of state identification and EPA selection of applicable or relevant and appropriate requirements ("ARARs"). EPA has solicited ARARS for the onsite portion of the remedy from the State of California in compliance with the National Contingency Plan, 40 C.F.R. Section 300.515(h). For further information on ARARs see the Administrative Record. Because the preferred remedy is described as including provision of the water to the City of Glendale (assuming the City accepts it), EPA would not consider the actual distribution of the water by the City to be part of the selected remedy. Such action by the City would have to meet any otherwise applicable permit requirements.

As stated above in response to #1, the preferred plan would require treatment of extracted groundwater to MCLs for all contaminants of concern. We also explained in that response why contaminants other than VOCs are not expected to occur in the extracted water. The Administrative Record identifies applicable or relevant and appropriate requirements for reinjection, as developed through correspondence with both the California Environmental Protection Agency and the Regional Water Quality Control Board, the agency with jurisdiction under state law over reinjection. While a permit for onsite reinjection would not be required, all ARARs selected for reinjection in the remedial action would be met.

4. EPA's Preferred Alternative

Your office indicated that the following sentence is not clear: "EPA is the lead agency for this project and the Department of Toxic Substances Control of the State of California Environmental Protection Agency (CAL-EPA) is the support agency." This sentence states that DTSC is the support agency to EPA for the San Fernando Valley Superfund cleanup, per the definition in 40 C.F.R Section 300.5 (see attachment 3).

Should you have any questions please do not hesitate to contact me at (415) 744-2249 or have your attorney contact Marcia Preston of the EPA Region IX Office of Regional Counsel at (415) 744-1388.

Sincerely,

Claire Trombadore

Claire Trombadore
Project Manager

cc: Marcia Preston, EPA Office of Regional Counsel

attachments

Attachment # 1

MEMORANDUM

CH2MHILL

TO: Claire Trombadore/EPA
Kevin Mayer/EPA

COPIES: Sybil Hatch/CH2M HILL/SFO

FROM: Daniel Wendell/CH2M HILL/LAO
Andy Austin/CH2M HILL/LAO

DATE: June 16, 1992

SUBJECT: Review of Metals Data from Monitoring Wells Located in the Glendale Study Area, North Operable Unit Area, San Fernando Valley

PROJECT: SFO69125.05.01

Introduction

To better evaluate and manage RI/FS efforts in the Glendale Study Area, EPA has divided the area into the "Glendale North Operable Unit" and "Glendale South Operable Unit" (Figure 1). Groundwater samples obtained from EPA's RI monitoring wells in the Glendale North Operable Unit (GNOU) area have been analyzed for potential organic and metal contaminants. Results of metals analyses indicate that metal concentrations are generally lower in filtered samples relative to unfiltered samples (CH2M HILL, December 30, 1991). Some metals have been detected in concentrations above primary and secondary MCLs, primarily in unfiltered samples. These unfiltered samples do not appear to accurately reflect insitu groundwater conditions (CH2M HILL, December 30, 1991). This memorandum provides a review of potential groundwater contamination in the GNOU area by metals that have promulgated primary or secondary MCLs. Primary MCLs are health-based standards whereas secondary MCLs address aesthetic concerns such as taste and odor. As part of this work, available metals concentration data were compiled and reviewed for RI wells and production wells located in the GNOU area.

Background

To date, 29 RI monitoring wells have been constructed in the GNOU area to better define the horizontal and vertical extent of contamination. Eleven of these monitoring wells are shallow water table monitoring wells (also referred to as "vertical profile borings" or "VPB"s), and 18 are "cluster wells" that are completed at deeper intervals. Most of the shallow water table monitoring wells in the GNOU area have been sampled for metals four times, and three of the wells have been sampled five times (CS-VPB-04, CS-VPB-05, and CS-VPB-06). The most recent sampling event was in April 1992; analytical results are not yet available for this sampling event. Cluster wells in the area have been sampled for metals three times, with the most recent sampling occurring in April 1992.

Dedicated submersible pumps for purging and sampling have recently been installed in most of the RI monitoring wells, and were used during the most recent (April 1992) sampling event. Prior to this sampling event, samples were typically obtained by installing a temporary submersible pump, purging, and then collecting groundwater samples with a bailer. However, dedicated submersible pumps for purging, and bladder pumps for sampling, were installed in CS-VPB-01, CS-VPB-04, CS-VPB-05, CS-VPB-07 and CS-VPB-08, were installed after the initial sampling, and were used in subsequent sampling efforts.

Metal samples from RI wells in the GNOU area have been obtained without the use of filters, using 1.2 um filters, and using 0.45 um filters. Resulting metals analyses have differed, indicating that metals concentrations are at least partially dependent upon filtering methods (CH2M HILL, December 30, 1991). Available data indicate that "sampling artifacts" can be significant in unfiltered samples (CH2M HILL, December 30, 1991). Sampling artifacts are related to the sampling process, and are unique to the well bore area. These artifacts include drilling fluids that have invaded the formation, and corrosion products that form in and near the well bore and sampling systems. Iron oxyhydroxides are a common corrosion product within a well bore environment and can strongly adsorb metals. Care must be taken to prevent these materials from entering the sample, or else the sample will not be representative of aquifer conditions. To address potential problems with sampling artifacts, metals sampling protocol for the RI monitoring wells now specifies use of 0.45 um filters. Such filtering is recommended by EPA (1986).

Discussion of GNOU Area Metals Data

To better evaluate which type of RI monitoring well samples (unfiltered, 1.2 um filtered, or 0.45 um filtered) best represent metals concentration within insitu GNOU area groundwater, results of metals analyses from production wells were compiled and compared with nearby RI monitoring well data (Appendix A). Due to prolonged pumping, these production wells should not be affected by well bore/sampling artifact effects, and samples from these wells should reflect the amount of metals transported by the local groundwater system. These wells are sampled without filters, using bottles that contain preservatives (Becky Luman, June 4, 1992; Ray Natario, June 4, 1992). Because many of the RI monitoring wells in the area are screened near or opposite production well screen, the two data sets should be similar (Figure 2; Appendix B). For example, RI monitoring wells CS-VPB-05, CS-C05-160, and CS-C05-290 are opposite much of the screen of production well CS-45 (Figure 2).

To aid in comparison of production well data and RI monitoring well data, the wells were divided into two local "subareas" that consist of relatively closely spaced wells (Figures 1 and 2; Tables 3 and 4). Because of the close proximity of the wells and similarity of screened intervals, and providing that sampling artifacts effects are not present, RI monitoring wells within each individual subarea should exhibit similar metals concentrations as the nearby production wells.

Metals concentration data for samples obtained from Subarea 1 and 2 production wells most closely resembles filtered data from the RI monitoring wells (Tables 1 and 2).

Results of unfiltered samples indicate relatively high concentrations of metals (commonly in exceedence of one or more primary and/or secondary MCL), and are *not* reflective of production well data. Therefore, unfiltered data are *not* considered to be representative of the metals content of local insitu groundwater.

Elevated concentrations of metals within the unfiltered samples are probably related to sampling artifacts. The sampling artifacts may have several possible origins. Most importantly, during installation of the temporary submersible pump used for purging it is likely that rust and other material inside the casing well was disturbed, resulting in suspension of particulate matter within the well; introduction of the bailer caused additional disturbance. Particulates that became suspended in the water within the well casing at this times may have been incorporated into the bailed samples, digested by the acid preservative in the sample bottle, leading to results that do not accurately reflect insitu groundwater conditions. For the above reasons, further discussions of metals data for the GNOU area concerns only filtered data.

Available production well data and filtered RI monitoring well data indicate that groundwater in the GNOU area generally meets both primary and secondary MCLs for metals (Table 3; Appendix C). Only four filtered RI monitoring well samples exhibit primary or secondary MCL exceedences:

- **CS-C01-105.** March 1991 sample results indicate 2,280 ug/l iron (secondary MCL = 300 ug/l), and 271 ug/l manganese (secondary MCL = 50 ug/l). Adjacent deeper cluster wells are below iron and manganese MCLs. It is possible that these relatively high iron and manganese concentrations represent field and/or laboratory contamination.

- **CS-C02-180.** March 1991 sample results indicate 54 ug/l manganese (secondary MCL = 50 ug/l). This represents a relatively small exceedence of a secondary (aesthetic) MCL.

- **CS-C02-250.** May 1990 sample results indicate 91 ug/l lead (primary MCL = 50 ug/l), and 8 ug/l mercury (primary MCL = 2 ug/l). A subsequent sample (March 1991) indicates nondetectable concentrations of these elements. Adjacent deep and shallow CS-C02 cluster wells also indicate nondetectable concentrations of lead and mercury.

- **CS-VPB-06.** May 1990 sample results indicate 3.4 ug/l mercury (primary MCL = 2 ug/l). A subsequent sample (May 1990) indicates nondetectable concentrations of mercury.

Summary and Conclusions

Previous work in the San Fernando Basin has shown that metals concentrations may vary depending upon filtering methods, and that unfiltered metals samples from RI wells are influenced by sampling artifacts. Production well samples are not influenced by sampling artifacts, and are therefore representative of local groundwater conditions. Metals data

from production wells located near some of the RI wells indicate generally low concentrations of metals, with all metal analytes below primary and secondary MCLs. Comparison of metals concentration data for the production wells with nearby RI monitoring wells indicates that concentrations of metals within filtered monitoring well samples are most similar to production well samples. Therefore, filtered RI monitoring well samples appear to provide the most representative metals data for insitu groundwater. Filtered metals data obtained from RI monitoring wells are generally below primary and secondary MCLs. The two observed primary MCL metals exceedences in filtered RI well samples have not been replicated. One of two observed secondary MCL metals exceedences in a filtered RI well sample (CS-C02-180) was relatively low, and the other (CS-C02-105) may have been affected by sample contamination. Results of the recent April 1992 quarterly sampling event, as well as results of ongoing groundwater monitoring by EPA in the eastern San Fernando Valley Basin, will help address these issues.

References

CH2M HILL, December 30, 1991, Review of Metals Data and Sampling Procedures, San Fernando Valley.

EPA, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document.

J.M. Montgomery Engineers, May 1977. Remedial Investigation of Groundwater Contamination in the San Fernando Valley, Final Draft, Section 7, Nature and Extent of Groundwater Contamination.

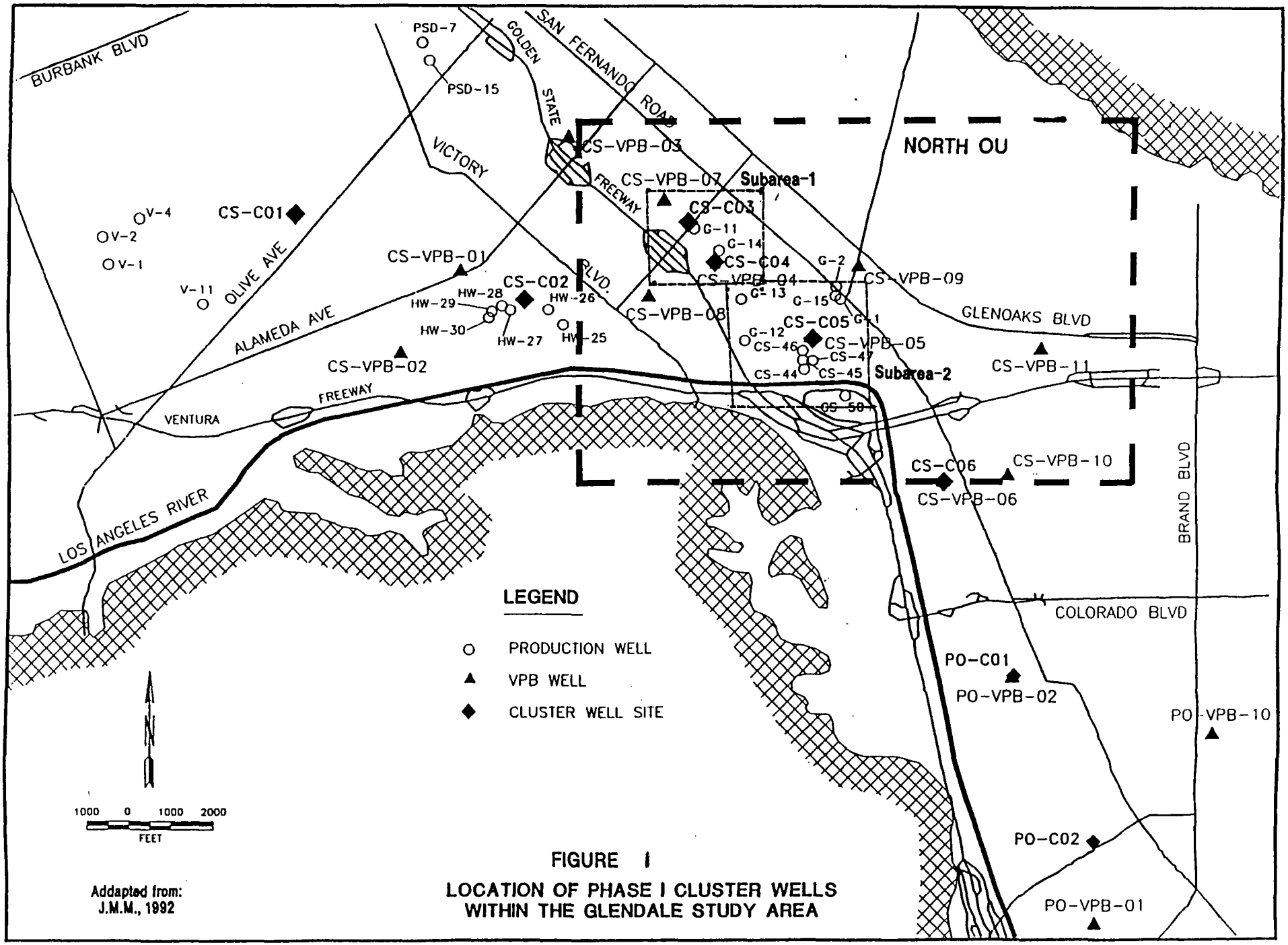
Los Angeles Department of Water and Power, January 1992. Technical Memorandum for Spinner Logging and Depth Specific Sampling with Related Aquifer Test Results, in the San Fernando Basin (SFB).

Luman, Becky, June 4, 1992, Los Angeles Department of Water and Power, personal communication.

Natario, Ray, June 4, 1992. City of Glendale, personal communication.

Puls, R.W. and Barcelona, M.J., 1989a, Filtration of Ground Water Samples for Metals Analysis, Hazardous Waste & Hazardous Materials, v. 6, No. 4, p.385-393.

Puls, R.W. and Barcelona, M.J., March 1989b, Ground Water Sampling for Metals Analyses, Superfund, Ground Water Issue, EPA/540/4-89/001.



Addapted from:
J.M.M., 1992

FIGURE 1
LOCATION OF PHASE I CLUSTER WELLS
WITHIN THE GLENDALE STUDY AREA

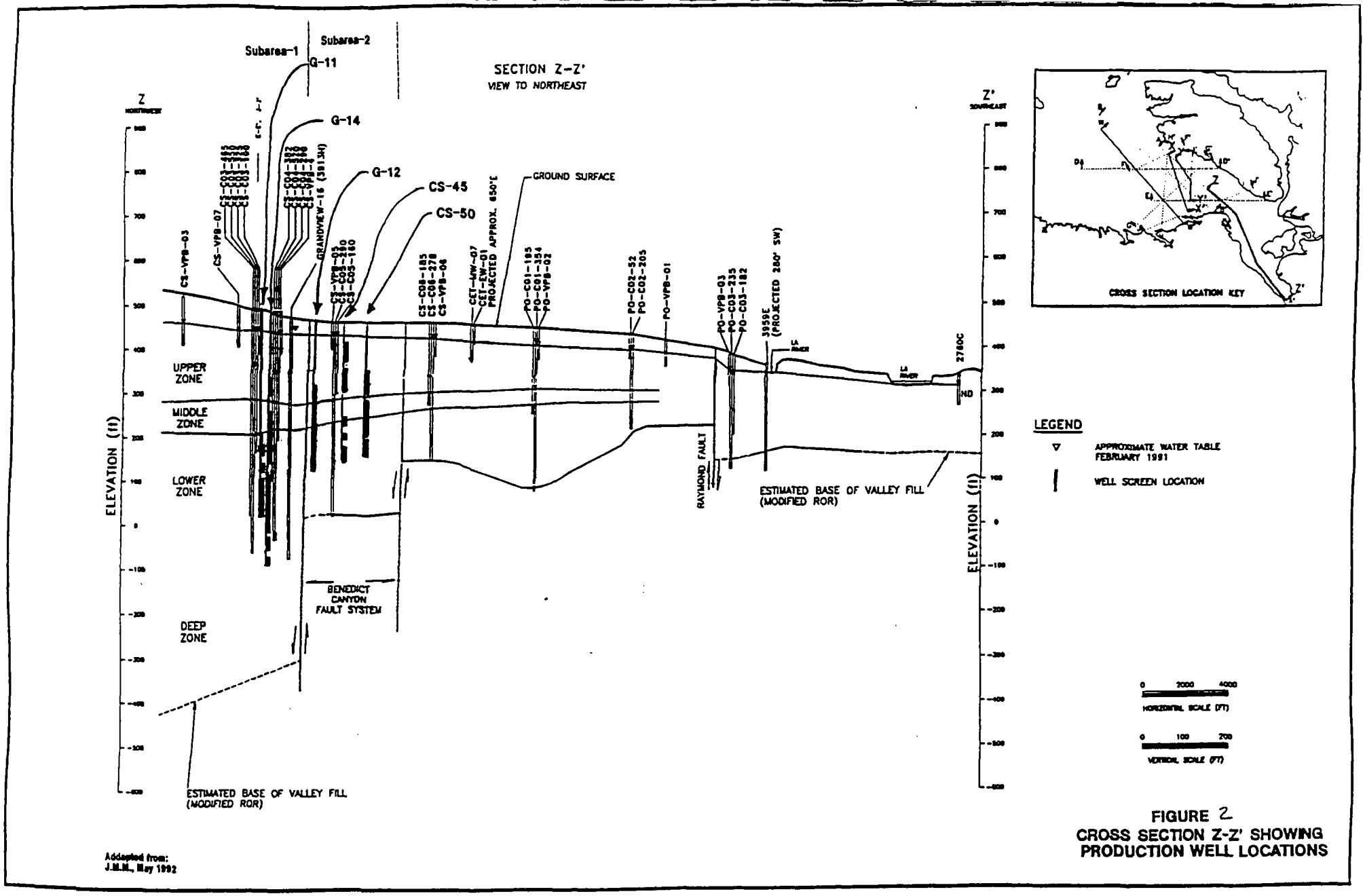


FIGURE 2
CROSS SECTION Z-Z' SHOWING PRODUCTION WELL LOCATIONS

TABLE I

North Operable Unit Metals Data for Subarea 1 (sorted by filter size)																
		Filt.		Primary MCL							Secondary MCL					
Well	Date	Size		As	Ba	Cd	Cr	Pb	Hg	Se	Cu	Fe	Mn	Zn		
			>MCL	50	2,000	10	50	50	2	10	1,000	300	50			
Production Wells:																
G-14	May-89			<1		<1	<5	2	<0.2	1	<20	<20	14	10		
G11	May-89			<1		<1	<5	2	<0.2	<1	<20	<20	14	7		
Filtered Analyses, 0.45 um:																
CS-C03-100	Apr-91	0.45 u		0.0	246	0.0	0	0.0	0.0	4.2	0	44	16	16		
CS-C03-325	Apr-91	0.45 u		0.0	71	0.0	0	0.0	0.0	0.0	4	57	31	0		
CS-C03-465	Apr-91	0.45 u		0.0	69	0.0	0	0.0	0.0	0.0	4	66	27	5		
CS-C03-550	Apr-91	0.45 u		0.0	56	0.0	0	0.0	0.0	0.0	4	93	41	0		
CS-C04-290	Mar-91	0.45 u		0.0	85	0.0	0	0.0	0.0	1.1	0	85	22	17		
CS-C04-382	Mar-91	0.45 u		0.0	82	0.0	0	3.0	0.0	1.6	0	134	16	5		
CS-C04-520	Mar-91	0.45 u		0.0	57	0.0	0	2.4	0.0	0.0	0	227	15	0		
Filtered Analyses, 1.2 um:																
CS-C03-100	Apr-91	1.2 u		0.0	248	0.0	0	0.0	0.0	1.1	0	65	21	14		
CS-C03-100	May-90	1.2 u		0.0				0.0	0.0	0.0				22		
CS-C03-325	May-90	1.2 u		0.0				0.0	0.7	0.0				15		
CS-C03-465	Apr-91	1.2 u		1.9	68	0.0	0	0.0	0.0	0.0	0	141	23	0		
CS-C03-465	May-90	1.2 u		0.0				0.0	0.0	0.0				11		
CS-C03-550	Apr-91	1.2 u		1.4	58	0.0	0	0.0	0.0	0.0	0	108	29	8		
CS-C03-550	May-90	1.2 u		0.0				0.0	0.0	0.0				13		
CS-C04-290	Mar-91	1.2 u		0.0	82	0.0	0	0.0	0.0	0.0	0	20	32	4		
CS-C04-290	May-90	1.2 u		0.0				0.0	0.0	0.0				12		
CS-C04-382	Mar-91	1.2 u		1.2	77	0.0	0	0.0	0.0	1.4	0	153	16	4		
CS-C04-382	May-90	1.2 u		0.0				0.0	0.0	0.0				10		
CS-C04-520	Mar-91	1.2 u		0.0	57	0.0	0	2.2	0.0	0.0	0	210	14	0		
CS-C04-520	May-90	1.2 u		0.0				0.0	0.6	0.0				0		
CS-VPB-03	Jan-91	1.2 u		0.0		0.0	0	0.0	0.0	0.0	0			8		
CS-VPB-04	Apr-91	1.2 u		2.2	116	0.0	28	14.0	0.0	0.0	0	8	13	5		
CS-VPB-04	Sep-90	1.2 u		16.0		0.0	0	0.0	0.0	0.0	0			28		
CS-VPB-04	May-90	1.2 u		0.0		0.0	70	0.0	0.0	0.0	0			28		
CS-VPB-04	Jan-90	1.2 u														
CS-VPB-07	Feb-91	1.2 u		0.0	123	0.0	7	0.0	0.4	0.0	0	25	17	8		
CS-VPB-07	Sep-90	1.2 u		16.0		0.0	0	0.0	0.0	0.0	0			0		
CS-VPB-07	Jan-90	1.2 u														
CS-C03-325	Apr-91	1.2u		1.0	74	0.0	0	0.0	0.0	0.0	0	113	21	33		

COMBO2.XLS: 6/16/92

TABLE 1

North Operable Unit Metals Data for Subarea 1 (sorted by filter size)																									
		Filt.		Primary MCL														Secondary MCL							
Well	Date	Size		As		Ba		Cd		Cr		Pb		Hg		Se		Cu		Fe		Mn		Zn	
			>MCL	50		2,000		10		50		50		2		10		1,000		300		50			
Unfiltered Analyses:																									
CS-C03-100	Apr-91	Unfilt	2	3.1		358		0.0		29		5.1		0.0		2.5		15		28,100	•	286	•	78	
CS-C03-325	Apr-91	Unfilt	2	0.0		127		0.0		24		2.1		0.0		1.0		10		23,200	•	295	•	112	
CS-C03-465	Apr-91	Unfilt	2	0.0		147		0.0		24		2.0		0.0		0.0		14		31,800	•	307	•	154	
CS-C03-550	Apr-91	Unfilt	2	1.0		71		0.0		0		4.4		0.0		0.0		49		12,800	•	135	•	89	
CS-C04-290	Mar-91	Unfilt	2	1.4		126		0.0		14		6.5		0.0		1.1		5		12,200	•	218	•	48	
CS-C04-382	Mar-91	Unfilt	2	1.2		94		0.0		0		1.4		0.0		1.7		0		8,720	•	96	•	28	
CS-C04-520	Mar-91	Unfilt	2	0.0		69		0.0		0		1.0		0.0		0.0		0		8,570	•	86	•	15	
CS-VPB-04	Sep-89	Unfilt	1	89.0	•			0.0		56	•	0.0		0.0		0.0		39						55	
Notes:	All values in ug/l																								
	"G" wells are Grandview wells and are sometimes referred to as "GV"																								
	"CS" - Crystal Springs wells																								
	"•" - denotes analyte detection above MCL																								
	"1" - denotes sample with detection above primary MCL.																								
	"2" - denotes sample with detection above secondary MCL (not shown where primary MCL is exceeded)																								

TABLE 2

North Operable Unit Metals Data for Subarea 2 (sorted by filter size)																			
		Filt.		Primary MCL									Secondary MCL						
Well	Date	Size		As		Ba		Cd		Cr		Pb		Hg		Se	Cu		Fe		Mn		Zn
			>MCL	50		2,000		10		50		50		2		10	1,000		300		50		
Production Wells:																							
CS-45	Mar-84			<10				2		<10		<10		<1		8	<20		-		<10		10
CS-45	Jul-81			<10				2		<10		<10		<1		3	<20		-		<10		10
CS-46	Mar-84			<10				2		<10		<10		<1		4	<20		-		<10		10
CS-46	Jul-81			<10				2		<10		<10		<1		3	<20		-		30		30
CS-50	Jul-81			<10				2		<10		<10		<1		3	<20		-		<10		80
CS-50	Mar-79			<10				2		<10		<10		<1		3	<20		-		30		20
G-1	May-89			<1				<1		<5		2		<0.2		<1	<20		<20		14		27
G-2	May-89			<1				<1		<5		2		<0.2		<1	<20		<20		14		6
G-12	May-89			<1				<1		<5		5		<0.2		1	<20		<20		14		12
G-15	May-89			<1				<1		<5		2		<0.2		<1	<20		<20		14		7
Filtered Analyses, 1.2 um:																							
CS-C05-160	Mar-91	1.2 u		0.0		75		0.0		0		1.1		0.0		1.6	0		71		17		0
CS-C05-160	May-90	1.2 u		0.0								0.0		0.4		0.0							8
CS-C05-290	Mar-91	1.2 u		0.0		158		0.0		0		1.1		0.0		2.2	0		72		16		9
CS-C05-290	May-90	1.2 u		0.0								0.0		0.0		0.0							12
CS-VPB-05	Feb-91	1.2 u		0.0		124		0.0		17		0.0		0.3		0.0	0		8		15		14
CS-VPB-05	Sep-90	1.2 u		11.0				0.0		0		0.0		0.0		0.0	0						40
CS-VPB-05	May-90	1.2 u		0.0				0.0		0		0.0		0.8		0.0	0						8
CS-VPB-05	Jan-90	1.2 u																					
Unfiltered Analyses:																							
CS-VPB-05	Sep-89	Unfilt	1	33.0				14.0	*	60	*	0.0		0.0		0.0	75						110
Notes:	All values in ug/l																						
	"G" wells are Grandview wells and are sometimes referred to as "GV"																						
	"CS" - Crystal Springs wells																						
	"*" - denotes analyte detection above MCL																						
	"1" - denotes sample with detection above primary MCL.																						
	"2" - denotes sample with detection above secondary MCL (not shown where primary MCL is exceeded)																						

TABLE 3

Glendale Study Area, North Operable Unit Area Metals Data																			
				Primary MCLs								Secondary MCLs							
Well	Date	Filt. Size		As		Ba	Cd	Cr	Pb		Hg		Se	Cu	Fe		Mn		Zn
			>MCL	50		1,000	10	50	50		2		10	1,000	300		50		5,000
Filtered Analyses, 0.45 um:																			
CS-C03-100	Apr-91	0.45 u		0.0		246	0.0	0	0.0		0.0		4.2	0	44		16		18
CS-C03-325	Apr-91	0.45 u		0.0		71	0.0	0	0.0		0.0		0.0	4	57		31		0
CS-C03-465	Apr-91	0.45 u		0.0		69	0.0	0	0.0		0.0		0.0	4	66		27		5
CS-C03-550	Apr-91	0.45 u		0.0		56	0.0	0	0.0		0.0		0.0	4	93		41		0
CS-C04-290	Mar-91	0.45 u		0.0		85	0.0	0	0.0		0.0		1.1	0	85		22		17
CS-C04-382	Mar-91	0.45 u		0.0		82	0.0	0	3.0		0.0		1.6	0	134		16		5
CS-C04-520	Mar-91	0.45 u		0.0		57	0.0	0	2.4		0.0		0.0	0	227		15		0
Filtered Analyses, 1.2 um:																			
CS-C01-105	Mar-91	1.2 u	2	0.0		106	0.0	0	0.0		0.0		1.1	0	2,280	*	271	*	16
CS-C01-105	Oct-90	1.2 u		0.0					0.0		0.0		0.0						104
CS-C01-285	Mar-91	1.2 u		0.0		93	0.0	6	0.0		0.0		0.0	0	62		8		17
CS-C01-285	Oct-90	1.2 u		0.0					0.0		0.0		0.0						15
CS-C01-558	Mar-91	1.2 u		0.0		62	0.0	0	0.0		0.0		0.0	0	72		42		12
CS-C01-558	Oct-90	1.2 u																	
CS-C02-062	Mar-91	1.2 u		0.0		87	0.0	0	0.0		0.0		1.5	0	57		6		16
CS-C02-062	May-90	1.2 u		0.0					0.0		0.0		0.0						36
CS-C02-180	Mar-91	1.2 u	2	1.8		51	0.0	0	0.0		0.0		3.0	0	181		54	*	0
CS-C02-180	May-90	1.2 u		0.0					0.0		0.0		0.0						38
CS-C02-250	Mar-91	1.2 u		1.3		58	0.0	0	0.0		0.0		0.0	0	148		40		0
CS-C02-250	May-90	1.2 u	1	0.0					91.0	*	8.0	*	0.0						26
CS-C02-335	Mar-91	1.2 u		1.1		73	0.0	0	0.0		0.0		0.0	0	128		26		0
CS-C02-335	May-90	1.2 u		0.0					0.0		0.0		0.0						17
CS-C03-100	Apr-91	1.2 u		0.0		248	0.0	0	0.0		0.0		1.1	0	65		21		14
CS-C03-100	May-90	1.2 u		0.0					0.0		0.0		0.0						22
CS-C03-325	May-90	1.2 u		0.0					0.0		0.7		0.0						15
CS-C03-465	Apr-91	1.2 u		1.9		68	0.0	0	0.0		0.0		0.0	0	141		23		0
CS-C03-465	May-90	1.2 u		0.0					0.0		0.0		0.0						11
CS-C03-550	Apr-91	1.2 u		1.4		58	0.0	0	0.0		0.0		0.0	0	108		29		8
CS-C03-550	May-90	1.2 u		0.0					0.0		0.0		0.0						13
CS-C04-290	Mar-91	1.2 u		0.0		82	0.0	0	0.0		0.0		0.0	0	20		32		4
CS-C04-290	May-90	1.2 u		0.0					0.0		0.0		0.0						12
CS-C04-382	Mar-91	1.2 u		1.2		77	0.0	0	0.0		0.0		1.4	0	153		16		4
CS-C04-382	May-90	1.2 u		0.0					0.0		0.0		0.0						10

TABLE 3

Glendale Study Area, North Operable Unit Area Metals Data															
		Filt.		Primary MCLs							Secondary MCLs				
Well	Date	Size		As	Ba	Cd	Cr	Pb	Hg	Se	Cu	Fe	Mn	Zn	
			>MCL	50	1,000	10	50	50	2	10	1,000	300	50	5,000	
CS-C04-520	Mar-91	1.2 u		0.0	57	0.0	0	2.2	0.0	0.0	0	210	14	0	
CS-C04-520	May-90	1.2 u		0.0				0.0	0.6	0.0				0	
CS-C05-160	Mar-91	1.2 u		0.0	75	0.0	0	1.1	0.0	1.6	0	71	17	0	
CS-C05-160	May-90	1.2 u		0.0				0.0	0.4	0.0				8	
CS-C05-290	Mar-91	1.2 u		0.0	158	0.0	0	1.1	0.0	2.2	0	72	16	9	
CS-C05-290	May-90	1.2 u		0.0				0.0	0.0	0.0				12	
CS-C06-185	May-90	1.2 u		0.0				0.0	0.5	0.0				8	
CS-C06-278	May-90	1.2 u													
CS-VPB-01	Feb-91	1.2 u		0.0	92	0.0	0	0.0	0.5	0.0	0	8	16	23	
CS-VPB-01	Sep-90	1.2 u													
CS-VPB-01	Jan-90	1.2 u													
CS-VPB-02	Sep-90	1.2 u		0.0		0.0	0	0.0	0.0	0.0	0			11	
CS-VPB-02	Jan-90	1.2 u													
CS-VPB-03	Jan-91	1.2 u		0.0		0.0	0	0.0	0.0	0.0	0			8	
CS-VPB-04	Apr-91	1.2 u		2.2	116	0.0	28	14.0	0.0	0.0	0	8	13	5	
CS-VPB-04	Sep-90	1.2 u		16.0		0.0	0	0.0	0.0	0.0	0			28	
CS-VPB-04	May-90	1.2 u		0.0		0.0	70	0.0	0.0	0.0	0			28	
CS-VPB-04	Jan-90	1.2 u													
CS-VPB-05	Feb-91	1.2 u		0.0	124	0.0	17	0.0	0.3	0.0	0	8	15	14	
CS-VPB-05	Sep-90	1.2 u		11.0		0.0	0	0.0	0.0	0.0	0			40	
CS-VPB-05	May-90	1.2 u		0.0		0.0	0	0.0	0.8	0.0	0			8	
CS-VPB-05	Jan-90	1.2 u													
CS-VPB-06	Feb-91	1.2 u		0.0	43	0.0	9	0.0	0.5	0.0	0	24	11	35	
CS-VPB-06	Sep-90	1.2 u		7.0		0.0	0	0.0	0.0	0.0	0			48	
CS-VPB-06	May-90	1.2 u	1	0.0		0.0	0	0.0	3.4	• 0.0	0			19	
CS-VPB-06	Jan-90	1.2 u													
CS-VPB-07	Feb-91	1.2 u		0.0	123	0.0	7	0.0	0.4	0.0	0	25	17	8	
CS-VPB-07	Sep-90	1.2 u		16.0		0.0	0	0.0	0.0	0.0	0			0	
CS-VPB-07	Jan-90	1.2 u													
CS-VPB-08	Feb-91	1.2 u		0.0	153	0.0	9	0.0	0.5	0.0	0	9	11	4	
CS-VPB-08	Sep-90	1.2 u		0.0		0.0	0	0.0	0.0	0.0	0			20	
CS-VPB-08	Jan-90	1.2 u													
CS-VPB-09	Sep-90	1.2 u		0.0		0.0	0	0.0	0.0	0.0	0			22	
CS-VPB-09	Jan-90	1.2 u													

TABLE 3

Glendale Study Area, North Operable Unit Area Metals Data																							
				Primary MCLs														Secondary MCLs					
Well	Date	Filt. Size		As		Ba		Cd		Cr		Pb		Hg		Se		Cu		Fe		Mn		Zn
			>MCL	50		1,000		10		50		50		2		10		1,000		300		50		5,000
CS-VPB-10	Sep-90	1.2 u		0.0				0.0		0		0.0		0.2		0.0		0						13
CS-VPB-10	Jan-90	1.2 u																						
CS-VPB-11	Sep-90	1.2 u		0.0				0.0		0		0.0		0.0		0.0		0						43
CS-VPB-11	Jan-90	1.2 u																						
CS-C03-325	Apr-91	1.2u		1.0		74		0.0		0		0.0		0.0		0.0		0		113		21		33
Unfiltered Analyses:																								
CS-C03-100	Apr-91	Unfilt	2	3.1		358		0.0		29		5.1		0.0		2.5		15		28,100	•	286	•	78
CS-C03-325	Apr-91	Unfilt	2	0.0		127		0.0		24		2.1		0.0		1.0		10		23,200	•	295	•	112
CS-C03-465	Apr-91	Unfilt	2	0.0		147		0.0		24		2.0		0.0		0.0		14		31,800	•	307	•	154
CS-C03-550	Apr-91	Unfilt	2	1.0		71		0.0		0		4.4		0.0		0.0		49		12,800	•	135	•	89
CS-C04-290	Mar-91	Unfilt	2	1.4		126		0.0		14		6.5		0.0		1.1		5		12,200	•	218	•	48
CS-C04-382	Mar-91	Unfilt	2	1.2		94		0.0		0		1.4		0.0		1.7		0		8,720	•	96	•	28
CS-C04-520	Mar-91	Unfilt	2	0.0		69		0.0		0		1.0		0.0		0.0		0		8,570	•	86	•	15
CS-VPB-01	Sep-89	Unfilt	1	95.0	•			6.0		99	•	55.0	•	3.4	•	0.0		58						94
CS-VPB-02	Sep-89	Unfilt	1	50.0	•			0.0		49		15.0		0.0		0.0		70						110
CS-VPB-04	Sep-89	Unfilt	1	89.0	•			0.0		56	•	0.0		0.0		0.0		39						55
CS-VPB-05	Sep-89	Unfilt	1	33.0				14.0	•	60	•	0.0		0.0		0.0		75						110
CS-VPB-06	Sep-89	Unfilt	1	25.0				0.0		26		0.0		1.4		0.0		32						65
CS-VPB-08	Sep-89	Unfilt	1	59.0	•			0.0		72	•	10.0		3.5	•	19.0	•	100						120
CS-VPB-09	Sep-89	Unfilt	1	85.0	•			0.0		120	•	8.0		0.0		0.0		82						220
CS-VPB-10	Sep-89	Unfilt	1	39.0				6.0		73	•	10.0		0.0		18.0	•	63						160
CS-VPB-11	Sep-89	Unfilt	1	115.0	•			0.0		83	•	25.0		0.0		0.0		78						240
Notes:	All values in ug/l																							
	"G" wells are Grandview wells and are sometimes referred to as "GV"																							
	"CS" - Crystal Springs wells																							
	"•" - denotes analyte detection above MCL																							
	"1" - denotes sample with detection above primary MCL.																							
	"2" - denotes sample with detection above secondary MCL (not shown where primary MCL is exceeded)																							

APPENDIX A

SANITARY ENGINEERING DIVISION

YEAR

LOCATION Crystal Springs #45 CHEMICAL ANALYSES (P.P.M.) Heavy Metals

Date	Lab #	As	Ba	Br	Cd	Total Cr	Cu	I	Pb	Mn	Hg ppb	Se	Ag	Zn	COD	TOC
9/29/78	R88	<.01	0.1	0.7	<.002	<.01	<.02	.08	<.01	.02	<.1	<.005	<.01	.02	1.0	0.7
1/13/79	R96	.01	0.1	0.6	<.002	<.01	<.02	.03	<.01	<.01	<.1	<.003	<.01	<.01	2.6	0.8
7/29/81	R100	<.01	0.1		<.002	<.01	<.02	.04	<.01	.01	<.1	<.003	<.01	.01	<1.0	
3-25-82	R122	<.01	<.25	1.4	<.002	<.01	0.02	0.02	<.01	<.01	<.1	0.005	<.01	<.01	5.4	1.0

SANITARY ENGINEERING DIVISION

YEAR

LOCATION Crystal Springs Well #46 CHEMICAL ANALYSES (P.P.M.) Heavy Metals

Date	Lab #	As	Ba	Br	Cd	Total Cr	Cu	I	Pb	Mn	Hg ppb	Se	Ag	Zn	COD	TOC	
1/24/77	R507	<.01	0.1	0.8	<.002	<.01	<.02	.06	<.01	.02	<.1	<.003	<.01	.18	<1.0		
1/13/79	R98	.01	0.1	0.5	<.002	<.01	<.02	.03	<.01	<.01	<.1	<.003	<.01	.01	<1.0	2.1	
1/17/79	R314	<.01	0.1	0.9	<.002	<.01	<.02	.05	<.01	<.01	<.1	<.003	<.01	.03	<1.0	-	
1/29/81	R101	<.01	0.1	0.5	<.002	<.01	<.02	.03	<.01	<.01	<.1	<.003	<.01	0.03	<1.0	*	
1-10-82	R419	<.01	0.10	0.82	<.002	<.01	0.01	0.034	<.01	<.01	<.1	0.004	<.01	<.01	<1	0.5	

SANITARY ENGINEERING DIVISION

YEAR

LOCATION Crystal Springs #50 CHEMICAL ANALYSES (P.P.M.) Heavy Metals

Date	Lab #	As	Ba	Br	Cd	Total Cr	Cu	I	Pb	Mn	Hg ppb	Se	Ag	Zn	COD	TOC
1/3/79	R97	.01	0.1	0.8	<.002	<.01	<.02	.05	<.01	.03	<0.1	<.003	<.01	.02	2.7	1.0
1/30/81	R97	<.01	0.1	0.6	<.002	<.01	.02	.06	<.01	<.01	<0.1	<.003	<.01	0.08	3.9	–

CC. STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report: 6/14/89	Lab Sample ID No.: J50839
Laboratory Name: Montgomery Labs	Signature Lab Director: Kimberly S. Boehm
Name of Sampler:	Sampler Employed By:
Date/Time Sample Collected: 5/15/89	Date/Time Sample Received at Lab: 5/15/89
	Were Holding Times Observed? YES
System Name: City of Glendale	System Number:
Description of Sampling Point:	
Name/No. of Sample Source: GV Well	Station Number:
Date & Time of Sample: 8 9 0 5 1 5 (Y Y M M D D T T T T)	Water Type: G (G/S)
User ID:	Submitted to SWQIS By:

MCL REPORTING UNITS	CONSTITUENT	TT	STORET CODE	ANALYSES RESULTS (mg/L)
	Analyzing Agency (Laboratory)		28	1919
mg/L	Total Hardness (as CaCO3)		900	209
mg/L	Calcium (Ca)		916	56.2
mg/L	Magnesium (Mg)		927	16.3
mg/L	Sodium (Na)		929	56.0
mg/L	Potassium (K)		937	2.3
Total Cations	meq/L Value: 6.66			
mg/L	Total Alkalinity (as CaCO3)		410	190
mg/L	Hydroxide (OH)		71830	0.00
mg/L	Carbonate (CO3)		445	0.96
mg/L	Bicarbonate (HCO3)		[illegible]	230
* mg/L	Sulfate (SO4)		945	56
* mg/L	Chloride (Cl)		940	43
45 mg/L	Nitrate (NO3)		71850	18.4
1.4-2.4 mg/L	Fluoride (F) Temp. Depend.		951	0.44
Total Anions	meq/L Value: 6.51			
Std Units	pH (Laboratory)		403	7.8
** umho/cm	Specific Conductance (E.C.)		95	640
*** mg/L	Total Filterable Residue at 180 deg C (TDS)		70300	390
UNITS	Apparent Color (Unfiltered)		81	
TON	Odor Threshold at 60 deg C		86	
NTU	Lab Turbidity		82079	
0.5 mg/L	MBAS		38260	<0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

cc: STATE DEPT. OF PUBLIC HEALTH 7/31/92

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: City of Glendale GV Well 1

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	< 2 . 1
1000	ug/L	Barium (Ba)		1007	1 3 0
10	ug/L	Cadmium (Cd)		1027	< 1
50	ug/L	Chromium (Total Cr)		1034	< 5
1000	ug/L*	Copper (Cu)		1042	1 3
300	ug/L*	Iron (Fe)		1045	< 3 0
50	ug/L	Lead (Pb)		1051	< 2 . 5
50	ug/L*	Manganese (Mn)		1055	< 1 4
2	ug/L	Mercury (Hg)		71900	< 0 . 2
10	ug/L	Selenium (Se)		1147	< 1
50	ug/L	Silver (Ag)		1077	< 1
5000	ug/L	Zinc (Zn)		1092	3 7

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			< 0 . 1

* Indicates Secondary Drinking Water Standards

CC: STATE DEPT. OF PUBLIC HEALTH 7/13/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 6/14/89	Lab Sample ID No. J50838
Laboratory Name Montgomery Eng	Signature Lab Director Kimberly S. Baker
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/15/89	Date/Time Sample Received at Lab
	Were Holding Times Observed? YES
System Name City of Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV Well 2	Station Number
Date & Time of Sample 8 9 0 5 1 5 (YYMMDDTTTT)	Water Type G (G/S)
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
		Analyzing Agency (Laboratory)		28	9590
	mg/L	Total Hardness (as CaCO3)		900	166
	mg/L	Calcium (Ca)		916	43.9
	mg/L	Magnesium (Mg)		927	10.5
	mg/L	Sodium (Na)		929	57.5
	mg/L	Potassium (K)		937	3.3
Total Cations		meq/L Value: 5.9			
	mg/L	Total Alkalinity (as CaCO3)		410	170
	mg/L	Hydroxide (OH)		71830	0.00
	mg/L	Carbonate (CO3)		445	0.84
	mg/L	Bicarbonate (HCO3)		[illegible]	206
*	mg/L .	Sulfate (SO4)		945	62
*	mg/L .	Chloride (Cl)		940	30
45	mg/L	Nitrate (NO3)		71850	10.12
1.4-2.4	mg/L	Fluoride (F) Temp. Depend.		951	0.41
Total Anions		meq/L Value: 5.72			
	Std Units	pH (Laboratory)		403	7.8
**	umho/cm .	Specific Conductance (E.C.)		95	565
***	mg/L .	Total Filterable Residue at 180 deg C (TDS)		70300	350
	UNITS	Apparent Color (Unfiltered)		81	
	TON	Odor Threshold at 60 deg C		86	
	NTU	Lab Turbidity		82079	
0.5	mg/L .	MBAS		38260	<0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

CCL. STATE DEPT. OF PUBLIC HEALTH : 7/31/84

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: \ City of Glendale GV Well 2

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	< 1
1000	ug/L	Barium (Ba)		1007	8 8
10	ug/L	Cadmium (Cd)		1027	< 1
50	ug/L	Chromium (Total Cr)		1034	< 5
1000	ug/L*	Copper (Cu)		1042	< 9
300	ug/L*	Iron (Fe)		1045	< 2 0
50	ug/L	Lead (Pb)		1051	< 2
50	ug/L*	Manganese (Mn)		1055	< 1 4
2	ug/L	Mercury (Hg)		71900	< 0 . 2
10	ug/L	Selenium (Se)		1147	< 1
50	ug/L	Silver (Ag)		1077	< 1
5000	ug/L	Zinc (Zn)		1092	< 6

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y N N D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			< 0 . 1

cc: STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 4/14/89	Lab Sample ID No. JOS 834
Laboratory Name Montgomery Labs	Signature Lab Director Kimberly S. Bach
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/15/89	Date/Time Sample Received at Lab 5/15/89
	Were Holding Times Observed? YES
System Name City of Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV Well 11	Station Number
Date & Time of Sample 8 9 0 5 1 5 (Y Y M M D D T T T T)	Water Type G/S
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS	CONSTITUENT	TT	STORET CODE	ANALYSES RESULTS
		Analyzing Agency (Laboratory)		28	9590
	mg/L	Total Hardness (as CaCO3)		900	185
	mg/L	Calcium (Ca)		916	54.3
	mg/L	Magnesium (Mg)		927	11.6
	mg/L	Sodium (Na)		929	31.0
	mg/L	Potassium (K)		937	3.5
Total Cations		meq/L Value: 5.15			
	mg/L	Total Alkalinity (as CaCO3)		410	175
	mg/L	Hydroxide (OH)		71830	0.00
	mg/L	Carbonate (CO3)		445	0.84
	mg/L	Bicarbonate (HCO3)		---	212
*	mg/L •	Sulfate (SO4)		945	49
*	mg/L •	Chloride (Cl)		940	14
45	mg/L	Nitrate (NO3)		71850	6.60
1.4-2.4	mg/L	Fluoride (F) Temp. Depend.		951	0.49
Total Anions		meq/L Value: 5.04			
	Std Units	pH (Laboratory)		403	7.8
**	umho/cm •	Specific Conductance (E.C.)		95	485
***	mg/L •	Total Filterable Residue at 180 deg C (TDS)		70300	290
	UNITS	Apparent Color (Unfiltered)		81	
	TON	Odor Threshold at 60 deg C		86	
	NTU	Lab Turbidity		82079	
0.5	mg/L •	MBAS		38260	0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

CC: STATE DEPT OF PUBLIC HEALTH 7/23/59

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: \ City of Glendale GV Well 11

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	<1
1000	ug/L	Barium (Ba)		1007	83
10	ug/L	Cadmium (Cd)		1027	<1
50	ug/L	Chromium (Total Cr)		1034	<5
1000	ug/L*	Copper (Cu)		1042	20
300	ug/L*	Iron (Fe)		1045	<20
50	ug/L	Lead (Pb)		1051	<2
50	ug/L*	Manganese (Mn)		1055	<14
2	ug/L	Mercury (Hg)		71900	.21
10	ug/L	Selenium (Se)		1147	<1
50	ug/L	Silver (Ag)		1077	<1
5000	ug/L	Zinc (Zn)		1092	7

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			<0.1

* Indicates Secondary Drinking Water Standards

Amy Segawa/Baker
7/31/89

cc: STATE DEPT. OF PUBLIC HEALTH

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 6/20/89	Lab Sample ID No. J51159
Laboratory Name Montgomery Labs	Signature Lab Director Kimberly S. Baker
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/16/89	Date/Time Sample Received at Lab 5/16/89
	Were Holding Times Observed? YES
System Name Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV Well #12	Station Number
Date & Time of Sample 8905161 (YYMMDDTTTT)	Water Type GW/S
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS	CONSTITUENT	TT	STORET CODE	ANALYSES RESULTS
		Analyzing Agency (Laboratory)		28	1959 0
	mg/L	Total Hardness (as CaCO3)		900	256
	mg/L	Calcium (Ca)		916	74.9
	mg/L	Magnesium (Mg)		927	16.6
	mg/L	Sodium (Na)		929	44.7
	mg/L	Potassium (K)		937	4.6
Total Cations		meq/L Value: 7.19			
	mg/L	Total Alkalinity (as CaCO3)		410	190
	mg/L	Hydroxide (OH)		71830	0.00
	mg/L	Carbonate (CO3)		445	11.92
	mg/L	Bicarbonate (HCO3)		440	228
*	mg/L	Sulfate (SO4)		945	98
*	mg/L	Chloride (Cl)		940	28
45	mg/L	Nitrate (NO3)		71850	18.92
1.4-2.4	mg/L	Fluoride (F) Temp. Depend.		951	0.47
Total Anions		meq/L Value: 6.96			
	Std Units	pH (Laboratory)		403	8.1
**	umho/cm	Specific Conductance (E.C.)		95	685
***	mg/L	Total Filterable Residue at 180 deg C (TDS)		70300	420
	UNITS	Apparent Color (Unfiltered)		81	
	TON	Odor Threshold at 60 deg C		86	
	NTU	Lab Turbidity		82079	
0.5	mg/L	MBAS		38260	<0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

cc: STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: \ Glendale GV Well #12

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	< 1
1000	ug/L	Barium (Ba)		1007	64
10	ug/L	Cadmium (Cd)		1027	< 1
50	ug/L	Chromium (Total Cr)		1034	< 5
1000	ug/L*	Copper (Cu)		1042	47
300	ug/L*	Iron (Fe)		1045	27
50	ug/L	Lead (Pb)		1051	5
50	ug/L*	Manganese (Mn)		1055	< 14
2	ug/L	Mercury (Hg)		71900	< 0.2
10	ug/L	Selenium (Se)		1147	1
50	ug/L	Silver (Ag)		1077	< 1
5000	ug/L	Zinc (Zn)		1092	12

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			< 0.1

* Indicates Secondary Drinking Water Standards

CC: STATE DEPT. OF PUBLIC HEALTH 7/21/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 6/14/89	Lab Sample ID No. J50833
Laboratory Name Montgomery Labs	Signature Lab Director Kimberly S. Bach
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/15/89	Date/Time Sample Received at Lab 5/15/89
	Were Holding Times Observed? YES
System Name City of Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV Well 14	Station Number
Date & Time of Sample 8 9 0 5 1 5 (Y Y M M D D T T T T)	Water Type G/S
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
		Analyzing Agency (Laboratory)		28	1990
	mg/L	Total Hardness (as CaCO3)		900	196
	mg/L	Calcium (Ca)		916	57.2
	mg/L	Magnesium (Mg)		927	12.7
	mg/L	Sodium (Na)		929	59.6
	mg/L	Potassium (K)		937	3.5
Total Cations		meq/L Value: 6.6			
	mg/L	Total Alkalinity (as CaCO3)		410	165
	mg/L	Hydroxide (OH)		71830	0.00
	mg/L	Carbonate (CO3)		445	01.84
	mg/L	Bicarbonate (HCO3)		[illegible]	2.00
*	mg/L	Sulfate (SO4)		945	82
*	mg/L	Chloride (Cl)		940	48
45	mg/L	Nitrate (NO3)		71850	8.36
1.4-2.4	mg/L	Fluoride (F) Temp. Depend.		951	0.71
Total Anions		meq/L Value: 6.52			
	Std Units	pH (Laboratory)		403	7.8
**	umho/cm	Specific Conductance (E.C.)		95	644
***	mg/L	Total Filterable Residue at 180 deg C (TDS)		70300	400
	UNITS	Apparent Color (Unfiltered)		81	
	TON	Odor Threshold at 60 deg C		86	
	NTU	Lab Turbidity		82079	
0.5	mg/L	MBAS		38260	0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

cc: STATE DEPT. OF PUBLIC HEALTH 7/31/87

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: City of Glendale GV Well 14

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	< 1
1000	ug/L	Barium (Ba)		1007	87
10	ug/L	Cadmium (Cd)		1027	< 1
50	ug/L	Chromium (Total Cr)		1034	< 5
1000	ug/L+	Copper (Cu)		1042	< 9
300	ug/L+	Iron (Fe)		1045	16
50	ug/L	Lead (Pb)		1051	< 2
50	ug/L+	Manganese (Mn)		1055	< 14
2	ug/L	Mercury (Hg)		71900	< 0.2
10	ug/L	Selenium (Se)		1147	1
50	ug/L	Silver (Ag)		1077	< 1
5000	ug/L	Zinc (Zn)		1092	< 10

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU		Field Turbidity		82078
C		Source Temperature		10
		Langelier Index Source Temp.		71814
		Langelier Index at 60 deg C		71813
Std. Units		Field pH		00400
		Aggressiveness Index		82383
mg/L		Silica		00955
mg/L		Phosphate		00650
mg/L		Iodide		71865
		Sodium Absorption Ratio		00931
		Asbestos		81855
mg/L		Aluminum		< 0.1

+ Indicates Secondary Drinking Water Standards

cc: STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 6/14/89	Lab Sample ID No. J50837
Laboratory Name Montgomery Labs	Signature Lab Director Kimberly S. Banks
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/15/89	Date/Time Sample Received at Lab 5/15/89
	Were Holding Times Observed? YES
System Name City of Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV well 15	Station Number
Date & Time of Sample 8 9 0 5 1 5 1 1 5 1 (Y Y M M D D T T T T)	Water Type G/S
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS		CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
			Analyzing Agency (Laboratory)		28	1 9 5 9 0
	mg/L		Total Hardness (as CaCO3)		900	1 4 9
	mg/L		Calcium (Ca)		916	4 2 . 9
	mg/L		Magnesium (Mg)		927	9 . 9
	mg/L		Sodium (Na)		929	8 3 . 7
	mg/L		Potassium (K)		937	3 . 1
Total Cations			meq/L Value: 6.69			
	mg/L		Total Alkalinity (as CaCO3)		410	1 7 0
	mg/L		Hydroxide (OH)		71830	0 . 0 0
	mg/L		Carbonate (CO3)		445	0 . 8 6
	mg/L		Bicarbonate (HCO3)		[illegible]	2 0 6
*	mg/L	.	Sulfate (SO4)		945	6 4
*	mg/L	.	Chloride (Cl)		940	5 7
45	mg/L		Nitrate (NO3)		71850	9 . 2 4
1.4-2.4	mg/L		Fluoride (F) Temp. Depend.		951	0 . 4 4
Total Anions			meq/L Value: 6.51			
	Std Units		pH (Laboratory)		403	7 . 8
**	umho/cm	.	Specific Conductance (E.C.)		95	6 5 5
***	mg/L	.	Total Filterable Residue at 180 deg C (TDS)		70300	4 0 0
	UNITS		Apparent Color (Unfiltered)		81	
	TON		Odor Threshold at 60 deg C		86	
	NTU		Lab Turbidity		82079	
0.5	mg/L	.	MBAS		38260	0 . 0 2

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

CC... STATE DEPT. OF PUBLIC HEALTH 7/31/87

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: City of Glendale GV Well 15

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	< 1
1000	ug/L	Barium (Ba)		1007	87
10	ug/L	Cadmium (Cd)		1027	< 1
50	ug/L	Chromium (Total Cr)		1034	< 5
1000	ug/L*	Copper (Cu)		1042	< 9
300	ug/L*	Iron (Fe)		1045	< 20
50	ug/L	Lead (Pb)		1051	< 2
50	ug/L*	Manganese (Mn)		1055	67
2	ug/L	Mercury (Hg)		71900	< .2
10	ug/L	Selenium (Se)		1147	< 1
50	ug/L	Silver (Ag)		1077	< 1
5000	ug/L	Zinc (Zn)		1092	7

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			< .1

CC: STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

TITLE 22 CHEMICAL ANALYSES

Date of Report 6/14/89	Lab Sample ID No. J50836
Laboratory Name Montgomery Labs	Signature Lab Director Kimberly S. Bank
Name of Sampler	Sampler Employed By
Date/Time Sample Collected 5/15/89	Date/Time Sample Received at Lab 5/15/89
Were Holding Times Observed? YES	
System Name City of Glendale	System Number
Description of Sampling Point	
Name/No. of Sample Source GV Well 16	Station Number
Date & Time of Sample 8 9 0 5 1 5 (YYMMDDTTTT)	Water Type G/S
User ID	Submitted to SWQIS By

MCL	REPORTING UNITS	CONSTITUENT	T	STORET CODE	ANALYSES RESULTS
		Analyzing Agency (Laboratory)		28	9590
	mg/L	Total Hardness (as CaCO3)		900	194
	mg/L	Calcium (Ca)		916	56.8
	mg/L	Magnesium (Mg)		927	12.4
	mg/L	Sodium (Na)		929	36.1
	mg/L	Potassium (K)		937	3.3
Total Cations		meq/L Value: 5.52			
	mg/L	Total Alkalinity (as CaCO3)		410	175
	mg/L	Hydroxide (OH)		71830	0.00
	mg/L	Carbonate (CO3)		445	0.85
	mg/L	Bicarbonate (HCO3)		[illegible]	212
*	mg/L .	Sulfate (SO4)		945	56
*	mg/L .	Chloride (Cl)		940	21
45	mg/L	Nitrate (NO3)		71850	11.4
1.6-2.4	mg/L	Fluoride (F) Temp. Depend.		951	0.47
Total Anions		meq/L Value: 5.47			
	Std Units	pH (Laboratory)		403	7.8
**	umho/cm .	Specific Conductance (E.C.)		95	520
***	mg/L .	Total Filterable Residue at 180 deg C (TDS)		70300	320
	UNITS	Apparent Color (Unfiltered)		81	
	TON	Odor Threshold at 60 deg C		86	
	NTU	Lab Turbidity		82079	
0.5	mg/L .	MBAS		38260	0.02

* 250-500-600 ** 900-1600-2200 *** 500-1000-1500

CC: STATE DEPT. OF PUBLIC HEALTH 7/31/89

MONTGOMERY LABORATORIES
Division of James M. Montgomery,
Consulting Engineers, Inc.

SYSTEM NAME & NUMBER: City of Glendale GV Well 16

* THE FOLLOWING CONSTITUENTS ARE REPORTED IN UG/L *

MCL	REPORTING UNITS	CONSTITUENT	T T	STORET CODE	ANALYSES RESULTS
50	ug/L	Arsenic (As)		1002	<1
1000	ug/L	Barium (Ba)		1007	94
10	ug/L	Cadmium (Cd)		1027	<1
50	ug/L	Chromium (Total Cr)		1034	<5
1000	ug/L*	Copper (Cu)		1042	14
300	ug/L*	Iron (Fe)		1045	<20
50	ug/L	Lead (Pb)		1051	<2
50	ug/L*	Manganese (Mn)		1055	<14
2	ug/L	Mercury (Hg)		71900	<0.2
10	ug/L	Selenium (Se)		1147	<1
50	ug/L	Silver (Ag)		1077	<1
5000	ug/L	Zinc (Zn)		1092	10

ORGANIC CHEMICALS

0.2	ug/L	Endrin		39390	
4	ug/L	Lindane		39340	
100	ug/L	Methoxychlor		39480	
5	ug/L	Toxaphene		39400	
100	ug/L	2,4-D		39730	
10	ug/L	2,4,5-TP Silvex		39045	
		Date ORGANIC Analyses Completed		73672	Y Y M M D D

ADDITIONAL ANALYSES

NTU	Field Turbidity		82078	
C	Source Temperature		10	
	Langelier Index Source Temp.		71814	
	Langelier Index at 60 deg C		71813	
Std. Units	Field pH		00400	
	Aggressiveness Index		82383	
mg/L	Silica		00955	
mg/L	Phosphate		00650	
mg/L	Iodide		71865	
	Sodium Absorption Ratio		00931	
	Asbestos		81855	
mg/L	Aluminum			<0.1

* Indicates Secondary Drinking Water Standards

APPENDIX B

CITY OF LOS ANGELES
HEADWORKS WELL SUMMARY

Well Name	LAFCD No.	Location	Year Drilled	Capacity (GPM)	Surface Elev.	HP/RPM	Well Diameter (inches)	Total Depth (ft)	Screened Interval Depths (ft)	Status
HW-25	3894BB	400' ± S.W. of Riverside Dr. 75' ± N.W. of Thompson Ave. 80' ± S.W. of Storm Channel	1956	3100	477.3	--	20	341	105-195, 230-303, 312-323	Inactive, available for future use. Pump pulled.
HW-26	3893L	425' ± S.W. of Riverside Dr. 175' ± N.W. of Irving Ave. 300' ± S.E. of Well 3893K	1956	2100	477.2	--	20	355	105-173, 194-211, 225-258, 267-306, 312-336	Inactive, available for future use. Pump pulled.
HW-27	3893K	Griffith Park-near end of Allen Ave. (north of L.A. River)	1956	2700	477.9	--	20	437	104-184, 194-205, 222-252, 267-343, 404-412	Inactive, available for future use. Pump pulled.
HW-28	3893M	approx 400' N.W. of Allen Ave. approx 1295' S. of Riverside Dr.	1967	3600	480.30	--	20	456	238-445	Inactive, available for future use. Pump pulled.
HW-29	3893N	south of flood channel approx 300' E. of Riverside Dr. and Main Street	1968	3700	480.00	--	20	495	235-362, 390-450	Inactive, available for future use. Pump pulled.
HW-30	3893P	south side of channel close to Riverside & Main St. 162' from well 3893N	1978	4300	482.7	--	20	445	165-190, 210-300, 310-400	Inactive, available for future use. Pump pulled.

Source: LADWP, 1991a

CITY OF GLENDALE
GRANDVIEW WELL SUMMARY

Well Name	LAFCD No.	Location	Year Drilled	Capacity (GPM)	Surface Elev.	Bowl Elev.	HP (RPM)	Well Diameter (inches)	Total Depth (ft)	Screened Interval Depths (ft)	Status[a]
GV-1	3913	6115 San Fernando Rd.	1916	1600	470.00	470.31	125	16	500.0	112-115, 153-160, 178-189, 208-217, 250-283, 298-326, 346-355, 380-482	Standby
GV-2	3913A	6135 San Fernando Rd.	1916	1700	471.00	471.32	125	16	500.0	112-122, 146-155, 188-193, 252-284, 308-328, 344-356, 389-460, 468-476	Active
GV-6	3913F	1029 Grand Central Ave. (Vault)	1923	--	468.00	457.50	150	18	504.0	87-145, 151-200, 229-259, 269-495	To Be Abandoned collapsed casing
GV-11	3903A	800 Western Ave.	1929	2000	488.60	489.93	200	18	494.0[b]	312-332, 360-372, 394-474 (535-558, 567-607)[b]	Active
GV-12	3914C	508 Paula Ave. (Vault)	1929	2000	468.20	455.76	200	18	534.0	155-184, 188-260, 266-355	Standby
GV-13	3903M	629 Hazel St. (Well and CL_2 House)	1953	2000	472.60	461.62	200	24	606.0	150-197, 256-270, 312-325, 385-400, 410-538, 545-578	No motor, but operable
GV-14	3903N	N.W. Corner Griffin Manor Park (3119 Flower St.)	1954	--	483.80	478.80	250	24	619.0	151-191, 235-352, 379-515, 526-552, 567-592	Caved well, not operational
GV-15	3913G	6129 San Fernando Rd.	1961	1500	470.60	470.87	125	20	500.0	258-284, 311-328, 348-360, 380-462	Active

CITY OF GLENDALE
GRANDVIEW WELL SUMMARY
(Continued)

Well Name	LAFCD No.	Location	Year Drilled	Capacity (GPM)	Surface Elev.	Bowl Elev.	HP (RPM)	Well Diameter (inches)	Total Depth (ft)	Screened Interval Depths (ft)	Status[a]
GV-16	3913H	1424 Airway	1964	1700	477.60	477.98	200	20	550.0	266-282, 286-306, 328-348, 362-390, 394-450, 478-490, 500-526	Standby

Source: Cruz, 1990

[a] Active denotes that wells are being pumped.
Standby denotes that pumps installed, but must have DHS permission to resume pumping.

[b] Original total depth of Well G-11 was 640.0. Well was filled with sand to 494 ft. bgs in 1985 due to high sulfur content in groundwater at this depth.

CITY OF LOS ANGELES
CRYSTAL SPRINGS WELL SUMMARY

Well Name	LAFCD No.	Location	Year Drilled	Capacity (GPM)	Surface Elev.	HP/RPM	Well Diameter (inches)	Total Depth (ft)	Screened Interval Depths (ft)	Status
CS-44	3914K	487' S.W. of Flower St. 1192' S.E.P.L. Paula Ave.	1927	Monitoring	448.05	75/970	20	296.0	50-68, 70-87, 97-160, 167-185, 209-236, 245-282	Inactive, eventually will be destroyed.
CS-45	3914L	287' S.W. of Flower St. 1192' S.E.P.L. Paula Ave.	1927	1600	456.22	75/970	20	338.0	50-93, 107-161, 220-236, 254-273 295-328	Inactive, available for future use.
CS-46	3914M	125' S.W. of Flower St. 1192' S.E. of S.E.P.L. Paula Ave.	1927	2400	458.15	75/970	20	357.0	50-72, 83-101, 118-164, 230-245, 265-280, 314-344	Inactive, available for future use.
CS-47	3914G	209' S.W. of Flower St. 1493' S.E.P.L. Paula Ave.	1930	--	447.78	--	16	288.5	60-120, 130-150, 195-270	Inactive, eventually will be destroyed.
CS-50	3914S	710' N. of Aviation Dr. 130' S.W. of Riverside Dr.	1956	1500	--	--	20	330.0	106-164, 178-262, 277-312	Inactive, available for future use.

Source: LADWP, 1991a

APPENDIX C

APPENDIX C

Glendale Study Area, North Operable Unit Area Metals Data																					
				Primary MCLs										Secondary MCLs							
Well	Date	Filt. Size		As		Ba		Cd		Cr		Pb		Hg		Se		Cu		Fe		Mn		Zn
			>MCL	50		1,000		10		50		50		2		10		1,000		300		50		5,000
CS-C01-105	Mar-91	1.2 u	2	0.0		106		0.0		0		0.0		0.0		1.1		0		2,280	•	271	•	16
CS-C01-105	Oct-90	1.2 u		0.0								0.0		0.0		0.0								104
CS-C01-285	Mar-91	1.2 u		0.0		93		0.0		6		0.0		0.0		0.0		0		62		8		17
CS-C01-285	Oct-90	1.2 u		0.0								0.0		0.0		0.0								15
CS-C01-558	Mar-91	1.2 u		0.0		62		0.0		0		0.0		0.0		0.0		0		72		42		12
CS-C01-558	Oct-90	1.2 u																						
CS-C02-062	Mar-91	1.2 u		0.0		87		0.0		0		0.0		0.0		1.5		0		57		6		16
CS-C02-062	May-90	1.2 u		0.0								0.0		0.0		0.0								36
CS-C02-180	Mar-91	1.2 u	2	1.8		51		0.0		0		0.0		0.0		3.0		0		181		54	•	0
CS-C02-180	May-90	1.2 u		0.0								0.0		0.0		0.0								38
CS-C02-250	Mar-91	1.2 u		1.3		58		0.0		0		0.0		0.0		0.0		0		148		40		0
CS-C02-250	May-90	1.2 u	1	0.0								91.0	•	8.0	•	0.0								26
CS-C02-335	Mar-91	1.2 u		1.1		73		0.0		0		0.0		0.0		0.0		0		128		26		0
CS-C02-335	May-90	1.2 u		0.0								0.0		0.0		0.0								17
CS-C03-100	Apr-91	0.45 u		0.0		246		0.0		0		0.0		0.0		4.2		0		44		16		16
CS-C03-100	Apr-91	1.2 u		0.0		248		0.0		0		0.0		0.0		1.1		0		65		21		14
CS-C03-100	Apr-91	Unfilt	2	3.1		358		0.0		29		5.1		0.0		2.5		15		28,100	•	286	•	78
CS-C03-100	May-90	1.2 u		0.0								0.0		0.0		0.0								22
CS-C03-325	Apr-91	0.45 u		0.0		71		0.0		0		0.0		0.0		0.0		4		57		31		0
CS-C03-325	Apr-91	1.2u		1.0		74		0.0		0		0.0		0.0		0.0		0		113		21		33
CS-C03-325	Apr-91	Unfilt	2	0.0		127		0.0		24		2.1		0.0		1.0		10		23,200	•	295	•	112
CS-C03-325	May-90	1.2 u		0.0								0.0		0.7		0.0								15
CS-C03-465	Apr-91	0.45 u		0.0		69		0.0		0		0.0		0.0		0.0		4		66		27		5
CS-C03-465	Apr-91	1.2 u		1.9		68		0.0		0		0.0		0.0		0.0		0		141		23		0
CS-C03-465	Apr-91	Unfilt	2	0.0		147		0.0		24		2.0		0.0		0.0		14		31,800	•	307	•	154
CS-C03-465	May-90	1.2 u		0.0								0.0		0.0		0.0								11
CS-C03-550	Apr-91	0.45 u		0.0		56		0.0		0		0.0		0.0		0.0		4		93		41		0
CS-C03-550	Apr-91	1.2 u		1.4		58		0.0		0		0.0		0.0		0.0		0		108		29		8
CS-C03-550	Apr-91	Unfilt	2	1.0		71		0.0		0		4.4		0.0		0.0		49		12,800	•	135	•	89
CS-C03-550	May-90	1.2 u		0.0								0.0		0.0		0.0								13
CS-C04-290	Mar-91	0.45 u		0.0		85		0.0		0		0.0		0.0		1.1		0		85		22		17
CS-C04-290	Mar-91	1.2 u		0.0		82		0.0		0		0.0		0.0		0.0		0		20		32		4
CS-C04-290	Mar-91	Unfilt	2	1.4		126		0.0		14		6.5		0.0		1.1		5		12,200	•	218	•	48
CS-C04-290	May-90	1.2 u		0.0								0.0		0.0		0.0								12

APPENDIX C

Glendale Study Area, North Operable Unit Area Metals Data																							
				Primary MCLs														Secondary MCLs					
Well	Date	Filt. Size		As		Ba		Cd		Cr		Pb		Hg		Se		Cu		Fe		Mn		Zn
			>MCL	50		1,000		10		50		50		2		10		1,000		300		50		5,000
CS-C04-382	Mar-91	Unfilt	2	1.2		94		0.0		0		1.4		0.0		1.7		0		8,720	•	96	•	28
CS-C04-382	Mar-91	0.45 u		0.0		82		0.0		0		3.0		0.0		1.6		0		134		16		5
CS-C04-382	Mar-91	1.2 u		1.2		77		0.0		0		0.0		0.0		1.4		0		153		16		4
CS-C04-382	May-90	1.2 u		0.0								0.0		0.0		0.0								10
CS-C04-520	Mar-91	Unfilt	2	0.0		69		0.0		0		1.0		0.0		0.0		0		8,570	•	86	•	15
CS-C04-520	Mar-91	0.45 u		0.0		57		0.0		0		2.4		0.0		0.0		0		227		15		0
CS-C04-520	Mar-91	1.2 u		0.0		57		0.0		0		2.2		0.0		0.0		0		210		14		0
CS-C04-520	May-90	1.2 u		0.0								0.0		0.6		0.0								0
CS-C05-160	Mar-91	1.2 u		0.0		75		0.0		0		1.1		0.0		1.6		0		71		17		0
CS-C05-160	May-90	1.2 u		0.0								0.0		0.4		0.0								8
CS-C05-290	Mar-91	1.2 u		0.0		158		0.0		0		1.1		0.0		2.2		0		72		16		9
CS-C05-290	May-90	1.2 u		0.0								0.0		0.0		0.0								12
CS-C06-185	May-90	1.2 u		0.0								0.0		0.5		0.0								8
CS-C06-278	May-90	1.2 u																						
CS-VPB-01	Feb-91	1.2 u		0.0		92		0.0		0		0.0		0.5		0.0		0		8		16		23
CS-VPB-01	Sep-90	1.2 u																						
CS-VPB-01	Jan-90	1.2 u																						
CS-VPB-01	Sep-89	Unfilt	1	95.0	•			6.0		99	•	55.0	•	3.4	•	0.0		58						94
CS-VPB-02	Sep-90	1.2 u		0.0				0.0		0		0.0		0.0		0.0		0						11
CS-VPB-02	Jan-90	1.2 u																						
CS-VPB-02	Sep-89	Unfilt	1	50.0	•			0.0		49		15.0		0.0		0.0		70						110
CS-VPB-03	Jan-91	1.2 u		0.0				0.0		0		0.0		0.0		0.0		0						8
CS-VPB-04	Apr-91	1.2 u		2.2		116		0.0		28		14.0		0.0		0.0		0		8		13		5
CS-VPB-04	Sep-90	1.2 u		16.0				0.0		0		0.0		0.0		0.0		0						28
CS-VPB-04	May-90	1.2 u		0.0				0.0		70		0.0		0.0		0.0		0						28
CS-VPB-04	Jan-90	1.2 u																						
CS-VPB-04	Sep-89	Unfilt	1	89.0	•			0.0		56	•	0.0		0.0		0.0		39						55
CS-VPB-05	Feb-91	1.2 u		0.0		124		0.0		17		0.0		0.3		0.0		0		8		15		14
CS-VPB-05	Sep-90	1.2 u		11.0				0.0		0		0.0		0.0		0.0		0						40
CS-VPB-05	May-90	1.2 u		0.0				0.0		0		0.0		0.8		0.0		0						8
CS-VPB-05	Jan-90	1.2 u																						
CS-VPB-05	Sep-89	Unfilt	1	33.0				14.0	•	60	•	0.0		0.0		0.0		75						110
CS-VPB-06	Feb-91	1.2 u		0.0		43		0.0		9		0.0		0.5		0.0		0		24		11		35
CS-VPB-06	Sep-90	1.2 u		7.0				0.0		0		0.0		0.0		0.0		0						48

Glendale Study Area, North Operable Unit Area Metals Data																		
		Filt.		Primary MCLs											Secondary MCLs			
Well	Date	Size		As		Ba	Cd	Cr		Pb	Hg		Se		Cu	Fe	Mn	Zn
			>MCL	50		1,000	10	50		50	2		10		1,000	300	50	5,000
CS-VPB-06	May-90	1.2 u	1	0.0			0.0	0		0.0	3.4	*	0.0		0			19
CS-VPB-06	Jan-90	1.2 u																
CS-VPB-06	Sep-89	Unfilt	1	25.0			0.0	26		0.0	1.4		0.0		32			65
CS-VPB-07	Feb-91	1.2 u		0.0		123	0.0	7		0.0	0.4		0.0		0	25	17	8
CS-VPB-07	Sep-90	1.2 u		16.0			0.0	0		0.0	0.0		0.0		0			0
CS-VPB-07	Jan-90	1.2 u																
CS-VPB-08	Feb-91	1.2 u		0.0		153	0.0	9		0.0	0.5		0.0		0	9	11	4
CS-VPB-08	Sep-90	1.2 u		0.0			0.0	0		0.0	0.0		0.0		0			20
CS-VPB-08	Jan-90	1.2 u																
CS-VPB-08	Sep-89	Unfilt	1	59.0	*		0.0	72	*	10.0	3.5	*	19.0	*	100			120
CS-VPB-09	Sep-90	1.2 u		0.0			0.0	0		0.0	0.0		0.0		0			22
CS-VPB-09	Jan-90	1.2 u																
CS-VPB-09	Sep-89	Unfilt	1	85.0	*		0.0	120	*	8.0	0.0		0.0		82			220
CS-VPB-10	Sep-90	1.2 u		0.0			0.0	0		0.0	0.2		0.0		0			13
CS-VPB-10	Jan-90	1.2 u																
CS-VPB-10	Sep-89	Unfilt	1	39.0			6.0	73	*	10.0	0.0		18.0	*	63			160
CS-VPB-11	Sep-90	1.2 u		0.0			0.0	0		0.0	0.0		0.0		0			43
CS-VPB-11	Jan-90	1.2 u																
CS-VPB-11	Sep-89	Unfilt	1	115.0	*		0.0	83	*	25.0	0.0		0.0		78			240

Notes: All values in ug/l

"G" wells are Grandview wells and are sometimes referred to as "GV"

"CS" - Crystal Springs wells

"*" - denotes analyte detection above MCL

"1" - denotes sample with detection above primary MCL.

"2" - denotes sample with detection above secondary MCL (not shown where primary MCL is exceeded)

Attachment 2

JAMES M. MONTGOMERY, INC.
365 Lennon Lane, Walnut Creek, California 94598

MEMORANDUM

TO:	Claire Trombadore	**DATE:**	June 18, 1992
FROM:	Eliana Makhlouf	**FILE:**	887.0312
PROJECT:	Glendale Study Area: North Plume Operable Unit (OU) Feasibility Study (FS)	**CLIENT:**	LADWP

SUBJECT: FIELD FILTERING OF GROUNDWATER SAMPLES

During the initial sampling (September, 1989) of the Crystal Springs vertical profile borings (VPBs), groundwater samples collected for priority pollutant metals were not field filtered (JMM, 1991). These samples contained a few slightly elevated concentrations (above maximum contaminant levels [MCLs]) of the following metals: arsenic, cadmium, chromium, lead, and mercury. Following the initial VPB sampling, concern arose over the representation of mobile, dissolved metal constituents versus immobile metals sorbed onto suspended solids present in the unfiltered groundwater samples, particularly from newly installed monitoring wells. In newly installed wells, suspended solids that are generally immobile in aquifer systems may have been introduced during drilling, or from formation disturbance of the naturally occurring mineral formations (commonly termed "sampling artifacts"). Furthermore, bailers were used during the initial sampling event since dedicated sampling pumps were not installed. Using bailers to collect groundwater samples may cause the entrainment of suspended solids, which are not representative of mobile constituents in the aquifer formation (USEPA, 1989). Additionally, as part of the U.S. Environmental Protection Agency (USEPA)-approved protocol, the groundwater samples collected for metal analyses were discharged directly into a sample bottle containing nitric acid preservative to increase sample holding times to 6 months. The nitric acid preservative effectively dissolves the suspended solids in the samples, releasing sorbed, coprecipitated, and occluded metal ions, thus increasing the metals concentrations in these samples.

During all subsequent sampling events in the Crystal Springs area (VPB Resampling, September 1990; Cluster Well Sampling Events, May and October 1990), metals samples were field filtered using a 1.2 micron (µm) cartridge filter to more accurately determine the mobile, dissolved metals concentrations in groundwater. During these events, only chromium and mercury were detected in one sample each at levels slightly above MCLs

(JMM, 1991). By considering only the most recent sample collected from each of the monitoring wells in the North Plume area, no metals were detected above MCLs in the Upper Zone of the aquifer. These data indicate that metals are not present at elevated levels (above MCLs) on a regional scale and that the detected levels are probably indicative of naturally occurring sediments. Therefore, although two metals were detected in one sample, each slightly above their respective MCLs, during earlier sampling events, these constituents are not prevalent and are not expected to be present in the extracted groundwater above their MCLs. Furthermore, the remedial alternatives presented in the Feasibility Study for the Glendale Study Area, North Plume OU (JMM, 1992) include prefiltration to remove suspended solids prior to treatment of the extracted groundwater for VOCs.

Based on the results of previous investigations and on a study of the effect of field filtration on the analysis of dissolved metals concentrations in groundwater conducted as part of the Remedial Investigation (RI) of Groundwater Contamination in the San Fernando Valley, the 1.2-µm filter was chosen for field filtration of metals samples. Field filtration with a 1.2-µm filter is assumed to eliminate errors introduced by the dissolution of immobile, suspended particulate matter ("sampling artifacts"), while reducing nonconservative errors, if the postulated facilitated transport mechanisms are important in metal transport in aquifers (Puls and Barcelona, 1989). Previous investigations conducted by Puls and Barcelona (1989) contend that colloids in the range of 0.1 to 1.0 µm may be mobile in sandy porous media; however, questions remain regarding the degree of colloid transport through silt and clay aquifers (Mason et al., 1992). Hiemenz (1977) also considers particles up to 1 µm to be colloidal. However, others (Turner Whitfield, 1980; Florence, 1982; and Salomens and Forstner, 1984) have operationally defined 0.45 µm as the border between the dissolved and particulate fractions. In the study conducted as part of the basin-wide RI, seven wells in two clusters were selected for filtered and unfiltered metals analyses. These wells represented groundwater sampled from the Upper, Lower, and Middle Zone depths of the aquifer. Three samples were collected from each well and were either unfiltered, passed through a 1.2-µm filter, or passed through a 0.45 µm filter.

Table 1 presents a summary of each constituent measured, and a relative comparison of the 1.2-µm-filtered value versus the unfiltered value as a percentage. The range and average for filtered sample value as a percent of unfiltered sample value are also presented on Table 1. The metals that were most impacted by 1.2-µm filtering were aluminum, iron, manganese, and zinc. The average value for filtered as a percent of unfiltered for these

constituents ranged from less than 1 to 45 percent. Barium, calcium, magnesium, and vanadium had overall lower concentrations in 1.2-µm filtered samples than unfiltered samples. Arsenic values in the 1.2-µm filtered and unfiltered samples were about the same except that the filtered values from the Upper Zone were lower than the unfiltered. Chromium values were lower in the 1.2-µm filtered groundwater samples from the Upper Zone and were the same as values in unfiltered samples from the deeper zones of the aquifer. Lead concentrations were lower overall in the 1.2-µm filtered groundwater samples, except in the deepest well in CS-C04, where the filtered values were twice the unfiltered values. Selenium concentrations were generally lower in concentration in the 1.2-µm filtered samples. Field filtering had no effect on analyses for antimony, beryllium, cadmium, cobalt, mercury, nickel, and thallium, and had very little effect on sodium. For silver and copper, filtering influenced analyses performed on groundwater samples from CS-C03 wells, but not on those from the CS-C04 wells.

The influence of filter size on metals concentrations was also investigated by separately filtering samples with a 0.45-µm and a 1.2-µm filter. Table 2 presents a comparison of the 1.2-µm-filtered value with the 0.45-µm-filtered value as a percent for each constituent. Results from separate analyses performed on the twenty-three 1.2-µm-filtered samples and the 0.45-µm-filtered samples indicated that the size of the filter did not significantly affect the results for 15 out of 23 constituents. The difference in filter size had the most influence on constituents such as antimony, arsenic, copper, iron, manganese, potassium, vanadium, and zinc. Therefore, the 1.2-µm filter was selected for use in subsequent sampling events to minimize the effects of metals associated with immobile suspended solids.

References

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TABLE 1

FILTERED (1.2 MICRON) SAMPLE VALUES AS A PERCENT OF UNFILTERED SAMPLE VALUES FOR METALS AND INORGANIC ANALYSES AT SELECTED CLUSTER WELLS

	Percent Value by Well							Range
	CS-CO3-100	CS-CO3-325	CS-CO3-465	CS-CO3-550	CS-CO4-290	CS-CO4-382	CS-CO4-520	
Aluminum	0	1	1	7	2	14	46	0 - 46
Antimony	92	100	100	100	136	159	100	92 - 159
Arsenic	42	100	190	140	71	100	100	42 - 190
Barium	69	58	46	81	65	82	84	46 - 84
Beryllium	100	100	100	100	100	100	100	100 - 100
Cadmium	100	100	100	100	100	100	100	100 - 100
Calcium	97	91	79	84	99	91	86	79 - 99
Chromium	27	33	34	100	43	100	100	27 - 100
Cobalt	100	100	100	100	100	100	100	100 - 100
Copper	20	29	22	6	100	100	100	6 - 100
Iron	0	0	0	1	0	2	2	0 - 2
Lead	20	48	50	23	15	71	220	15 - 220
Magnesium	87	83	81	92	96	97	92	81 - 97
Manganese	7	7	7	21	15	16	16	7 - 21
Mercury	100	100	100	100	100	100	100	100 - 100
Nickel	100	100	100	100	100	100	100	100 - 100
Potassium	44	79	69	92	100	139	107	44 - 139
Selenium	79	100	100	100	91	82	100	79 - 100
Silver	48	66	63	100	100	100	100	48 - 100
Sodium	97	101	97	95	103	98	94	91 - 103
Thallium	100	100	100	100	100	100	100	100 - 100
Vanadium	33	33	17	62	35	67	84	17 - 84
Zinc	18	29	3	9	9	15	29	3 - 29

TABLE 2

FILTERED (0.45 MICRON) SAMPLE VALUES AS A PERCENT OF FILTERED (1.2 MICRON) SAMPLE VALUES FOR METALS AND INORGANIC ANALYSES AT SELECTED CLUSTER WELLS

	Percent Value by Well							Range
	CS-CO3-188	CS-CO3-325	CS-CO3-465	CS-CO3-550	CS-CO4-298	CS-CO4-382	CS-CO4-520	
Aluminum	4879	100	100	100	100	100	100	100 - 4879
Antimony	87	100	100	100	167	66	100	66 - 167
Arsenic	100	100	53	71	100	83	100	53 - 100
Barium	99	96	101	98	103	106	100	96 - 106
Beryllium	100	100	100	100	100	100	100	100 - 100
Cadmium	100	100	100	100	100	100	100	100 - 100
Calcium	102	99	106	104	101	105	102	99 - 106
Chromium	100	100	100	100	100	100	100	100 - 100
Cobalt	100	100	100	100	100	100	100	100 - 100
Copper	100	123	133	130	100	100	100	100 - 133
Iron	68	50	46	86	340	88	108	46 - 340
Lead	100	100	100	100	100	300	109	100 - 300
Magnesium	101	100	103	104	98	104	101	98 - 104
Manganese	80	150	118	143	49	103	109	49 - 150
Mercury	100	100	100	100	100	100	100	100 - 100
Nickel	100	100	100	100	100	100	100	100 - 100
Potassium	108	92	107	105	69	100	100	69 - 108
Selenium	382	100	100	100	110	114	100	100 - 382
Silver	88	100	100	100	100	100	100	88 - 100
Sodium	100	98	102	104	98	105	103	98 - 105
Thallium	100	100	100	100	100	100	100	100 - 100
Vanadium	109	56	133	87	170	74	125	56 - 170
Zinc	116	12	118	51	95	107	100	12 - 118

Discussion of Papers

DISCUSSION OF "Literature Review and Model (COMET) for Colloid/Metals Transport in Porous Media," by W. B. Mills, S. Liu, and F. K. Fong, March-April 1991 issue, v. 29, no. 2, pp. 199-208

by Sharon A. Mason, John Barkach, and James Dragun, The Dragun Corporation, 3240 Coolidge, Berkley, Michigan 48072-1634

Effect of Filtration on Colloid Transport in Soil

Introduction

Colloid transport in subsurface media has been investigated and discussed by several researchers (Bitton et al., 1979; Jansons et al., 1989; Keswick and Gerba, 1980; Lance and Gerba, 1984; McCarthy, 1990; McDowell-Boyer et al., 1986; Reddy et al., 1981; Wollum and Cassel, 1978; Yates et al., 1987). Mills et al. (1991) discussed the primary mechanisms that influence the transport of colloids. Futthermore, they have proposed a model that can be used to evaluate the significance of the transport of colloids in soil systems.

First, Mills et al. (1991) have correctly identified Brownian motion as a primary mechanism affecting colloid transport in soil. In general, Brownian motion refers to the suspension of colloidal particles in a liquid due to the impact of the molecules comprising the liquid upon the colloidal particles (McDowell-Boyer et al., 1986; O'Melia, 1980; Prieve and Ruckenstein, 1974; Sax and Lewis, 1987; Tien and Payatakes, 1979; and Yao et al., 1971).

Second, Mills et al. (1991) have correctly identified that colloid surface forces are a primary mechanism affecting colloid transport in soil. These mechanisms basically cause the particles to either "stick" to or repel from one another after collision (McDowell-Boyer et al., 1986; and Prieve and Ruckenstein, 1974).

Although Mills et al. (1991) briefly mention filtration, they for all practical purposes ignore this mechanism in the model.

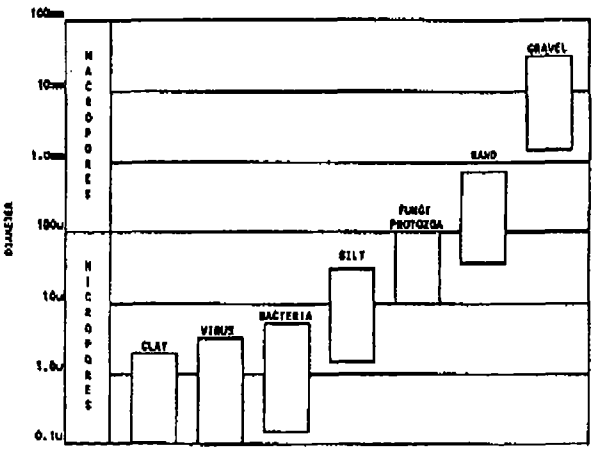

Fig. 1. Ranges of diameters for soil particles and biota (Dragun, 1988).

Yet, the effect of this mechanism on colloid transport in soil systems and on modeling colloid transport is profound. Because the effect of filtration is not considered in the model, the model output may be misleading.

This paper will briefly discuss the importance of filtration. Also, it will present an equation for determining if filtration will inhibit the migration of colloidal particles in soil systems. This equation should be utilized to determine if the model proposed by Mills et al. (1991) can be used to evaluate the significance of the migration of metals via colloid transport in soil systems.

How Soil Pore Size Restricts Colloid Transport

For colloids to migrate in porous media, colloid size as well as the pore size of the soil/aquifer material must be considered (Dragun, 1988; Enfield et al., 1989; Matthess and Pekdeger, 1981; Rege and Fogler, 1988; Tien and Payatakes, 1979). For migration of a colloidal particle to occur in soil, the diameter of the migrating colloid particle must be significantly smaller than the diameter of the soil pore. If it is not, then the particle is "filtered" from the migrating liquid.

How to Predict the Effect of Soil Pore Size on Colloid Transport

A general rule for the migration of bentonite particles in grout through soil pores can be utilized to estimate the migration potential of any particle in soil. A bentonite particle will penetrate soil pores if the ratio, R, is at least 29 and preferably greater than 24. R is defined as follows (Spooner et al., 1984):

$$R = D_{15}/D_{85} \qquad (1)$$

and D_{15} = diameter of the particles comprising the soil, where 15 percent of the soil mass is finer; and D_{85} = diameter of the migrating bentonite (or soil) particle, where 85 percent of the particles is finer.

It is important to recognize that equation (1) can be utilized not only for identifying the migration potential of a soil particle, but also for colloids, including bacterium and virus particles.

Figure 1 illustrates the ranges of diameters for soil particles and biota. We can show the utility of equation (1) and Figure 1 for identifying the migration potential of any particle.

Bacteria and viruses have diameters generally similar to that of clay. According to Figure 1, the D_{85} for bacteria is approximately 1.2 u. For bacteria to migrate, the D_{15} of the soil must be 30.0 u, based on the previous equation and assuming an R equal to 25.

A further analysis of Figure 1 will reveal that if this colloid is going to migrate, 85 percent of the soil texture must be comprised of coarser silt, sand, and gravel. The soil classes corresponding to this textural range are sandy loams, loamy sands, and sands. Based on this analysis, bacteria should not migrate in silty and clay soils due to their small pore diameters. Likewise, colloidal clay particles should not migrate in silty and clay soils due to their small pore diameters.

The data on bacteria, virus, and clay migration in soil and ground water from many published studies (see Table 1) support the conclusion that colloid size particles generally migrate in sand, coarse sand, and gravel. Conversely, bacteria, virus, and clay colloid migration in silt and clay soils are restricted via filtration; this conclusion, however, should not apply to macropores in these soils.

The model proposed by Mills et al. (1991) did not present a method by which a user could determine if the effect of filtration was significant, which could preclude the use of the proposed model. Equation (1) can be used to determine if the proposed model can give meaningful results and avoid the generation of misleading data.

Table 1. Studies of the Migration of Colloid Size Particles Through Porous Materials

Aquifer material	*Colloid*	*Reference*
Silica sand	Staphylococcus aureus	Hendricks et al., 1979
Sand	Poliovirus	Wang et al., 1981
Sandy loam	Poliovirus	Wang et al., 1981
Sand	Latex particles (0.091 u)	Yao et al., 1971
Dune sand	Poliovirus	Lance and Gerba, 1982
Sand	Bacteria	Lance and Gerba, 1982
Gravel and fine sands	Bacillus coli, fecal coliforms, and fecal streptococci	Crane and Moore, 1984
Sand and gravel	0.1 to 2 um	Gschwend et al., 1990
Gravel, sand, and silt	<2 nm	Waber et al., 1990
Sand	Poliovirus	Vilker, 1980
Sand	Latex microspheres (0.12 um)	Lahav and Tropp, 1980
Sand	Zoospores	Wilkinson et al., 1981
Sandy clay loam	Zoospores	Wilkinson et al., 1981
Loam	Zoospores	Wilkinson et al., 1981
Sand	Streptomyces	Wollum and Cassel, 1978
Sand	Poliovirus	Jansons et al., 1989
Pea gravel and loamy sand	Poliovirus	Lance and Gerba, 1984

Summary and Conclusions

In summary, for colloids to migrate in porous media, colloid size as well as pore size of the soil/aquifer material must be considered. The diameter of the migrating colloid particle must be significantly smaller than the diameter of the soil pore for migration to occur; otherwise, filtration of the colloidal particle suspended in the migrating liquid will occur. An analysis of published data on bacteria, viruses, and clay migration in soil reveals that these colloid size particles generally migrate in sand, coarse sand, and gravel. Therefore, in order to accurately model colloid transport in porous media, colloid size as well as pore size of the subsurface media must be considered.

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REPLY TO the preceding Discussion by Sharon A. Mason, John Barkach, and James Dragun of "Literature Review and Model (COMET) for Colloid/Metals Transport in Porous Media"

by William B. Mills, Sally Liu, and Fred K. Fong

We appreciate Mason et al. detailed discussion of filtration on colloid transport, and in particular their equation (1) which can be used to approximate pore size effects on colloid transport. As indicated in our paper, COMET is intended to be "a low-level test model of the effects of colloid facilitated transport" (i.e., a screening model). Consequently, the approach to colloid filtration offered by Mason et al. is consistent with the screening level approach of COMET, and therefore offers valuable information on whether the model is appropriate for a particular aquifer application.

CORRECTIONS TO "Subsurface Partitioning of Volatile Organic Compounds: Effects of Temperature and Pore-Water Content," September-October 1991 Issue, v. 29, no. 5, pp. 678-684

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Please note the following corrections to my paper:

1. Equation (5) should have $C_s\partial(H/K_D)/\partial T$ as the first term on the right-hand side.

2. The second term on the right-hand side of equation (13) should be:

$$HC_w(\Delta H_{wg}/RT^2)$$

3. C_s in equation (22) should be C_g.

4. In the line above equation (21), "... surface ..." should be "... subsurface ..."

I hope these errors have not caused any trouble for readers.

Table of Contents

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Attachment #3

State means the several states of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the Virgin Islands, the Commonwealth of Northern Marianas, and any other territory or possession over which the United States has jurisdiction. For purposes of the NCP, the term includes Indian tribes as defined in the NCP except where specifically noted. Section 126 of CERCLA provides that the governing body of an Indian tribe shall be afforded substantially the same treatment as a state with respect to certain provisions of CERCLA. Section 300.515(b) of the NCP describes the requirements pertaining to Indian tribes that wish to be treated as states.

Superfund Memorandum of Agreement (SMOA) means a nonbinding, written document executed by an EPA Regional Administrator and the head of a state agency that may establish the nature and extent of EPA and state interaction during the removal, pre-remedial, remedial, and/or enforcement response process. The SMOA is not a site-specific document although attachments may address specific sites. The SMOA generally defines the role and responsibilities of both the lead and the support agencies.

Superfund state contract is a joint, legally binding agreement between EPA and a state to obtain the necessary assurances before a federal-lead remedial action can begin at a site. In the case of a political subdivision-lead remedial response, a three-party Superfund state contract among EPA, the state, and political subdivision thereof, is required before a political subdivision takes the lead for any phase of remedial response to ensure state involvement pursuant to section 121(f)(1) of CERCLA. The Superfund state contract may be amended to provide the state's CERCLA section 104 assurances before a political subdivision can take the lead for remedial action.

Support agency means the agency or agencies that provide the support agency coordinator to furnish necessary data to the lead agency, review response data and documents, and provide other assistance as requested by the OSC or RPM. EPA, the USCG, another federal agency, or a state may be support agencies for a response action if operating pursuant to a contract executed under section 104(d)(1) of CERCLA or designated pursuant to a Superfund Memorandum of Agreement entered into pursuant to subpart F of the NCP or other agreement. The support agency may also concur on decision documents.

Support agency coordinator (SAC) means the official designated by the support agency, as appropriate, to interact and coordinate with the lead agency in response actions under subpart E of this part.

Surface collecting agents means those chemical agents that form a surface film to control the layer thickness of oil.

Threat of discharge or release, see definitions for discharge and release.

Threat of release, see definition for release.

Treatment technology means any unit operation or series of unit operations that alters the composition of a hazardous substance or pollutant or contaminant through chemical, biological, or physical means so as to reduce toxicity, mobility, or volume of the contaminated materials being treated. Treatment technologies are an alternative to land disposal of hazardous wastes without treatment.

Trustee means an official of a federal natural resources management agency designated in subpart G of the NCP or a designated state official or Indian tribe who may pursue claims for damages under section 107(f) of CERCLA.

United States when used in relation to section 311(a)(5) of the CWA, means the states, the District of Columbia, the Commonwealth of Puerto Rico, the Northern Mariana Islands, Guam, American Samoa, the United States Virgin Islands, and the Pacific Island Governments. United States, when used in relation to section 101(27) of CERCLA, includes the several states of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Commonwealth of the Northern Marianas, and any other territory or possession over which the United States has jurisdiction.

Vessel as defined by section 101(28) of CERCLA, means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water; and, as defined by section 311(a)(3) of the CWA, means every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water other than a public vessel.

Volunteer means any individual accepted to perform services by the lead agency which has authority to accept volunteer services (examples: See 16 U.S.C. 742f(c)). A volunteer is subject to the provisions of the authorizing statute and the NCP.

§ 300.6 Use of number and gender.

As used in this regulation, words in the singular also include the plural and words in the masculine gender also include the feminine and vice versa, as the case may require.

§ 300.7 Computation of time.

In computing any period of time prescribed or allowed in these rules of practice, except as otherwise provided, the day of the event from which the designated period begins to run shall not be included. Saturdays, Sundays, and federal legal holidays shall be included. When a stated time expires on a Saturday, Sunday, or legal holiday, the stated time period shall be extended to include the next business day.

Subpart B—Responsibility and Organization for Response

§ 300.100 Duties of President delegated to federal agencies.

In Executive Order 11735 and Executive Order 12580, the President delegated certain functions and responsibilities vested in him by the CWA and CERCLA, respectively.

§ 300.105 General organization concepts.

(a) Federal agencies should:

(1) Plan for emergencies and develop procedures for addressing oil discharges and releases of hazardous substances, pollutants, or contaminants;

(2) Coordinate their planning, preparedness, and response activities with one another;

(3) Coordinate their planning, preparedness, and response activities with affected states and local governments and private entities; and

(4) Make available those facilities or resources that may be useful in a response situation, consistent with agency authorities and capabilities.

(b) Three fundamental kinds of activities are performed pursuant to the NCP:

(1) Preparedness planning and coordination for response to a discharge of oil or release of a hazardous substance, pollutant, or contaminant;

(2) Notification and communications; and

(3) Response operations at the scene of a discharge or release.

(c) The organizational elements created to perform these activities are:

(1) The National Response Team (NRT), responsible for national response and preparedness planning, for coordinating regional planning, and for providing policy guidance and support to the Regional Response Teams. NRT membership consists of representatives from the agencies specified in § 300.175.

(2) Regional Response Teams (RRTs), responsible for regional planning and preparedness activities before response